Airfield Research Group Ltd

ARG Research Note No.13: Very Heavy Bomber Stations Control Tower

Paul Francis – August 2005

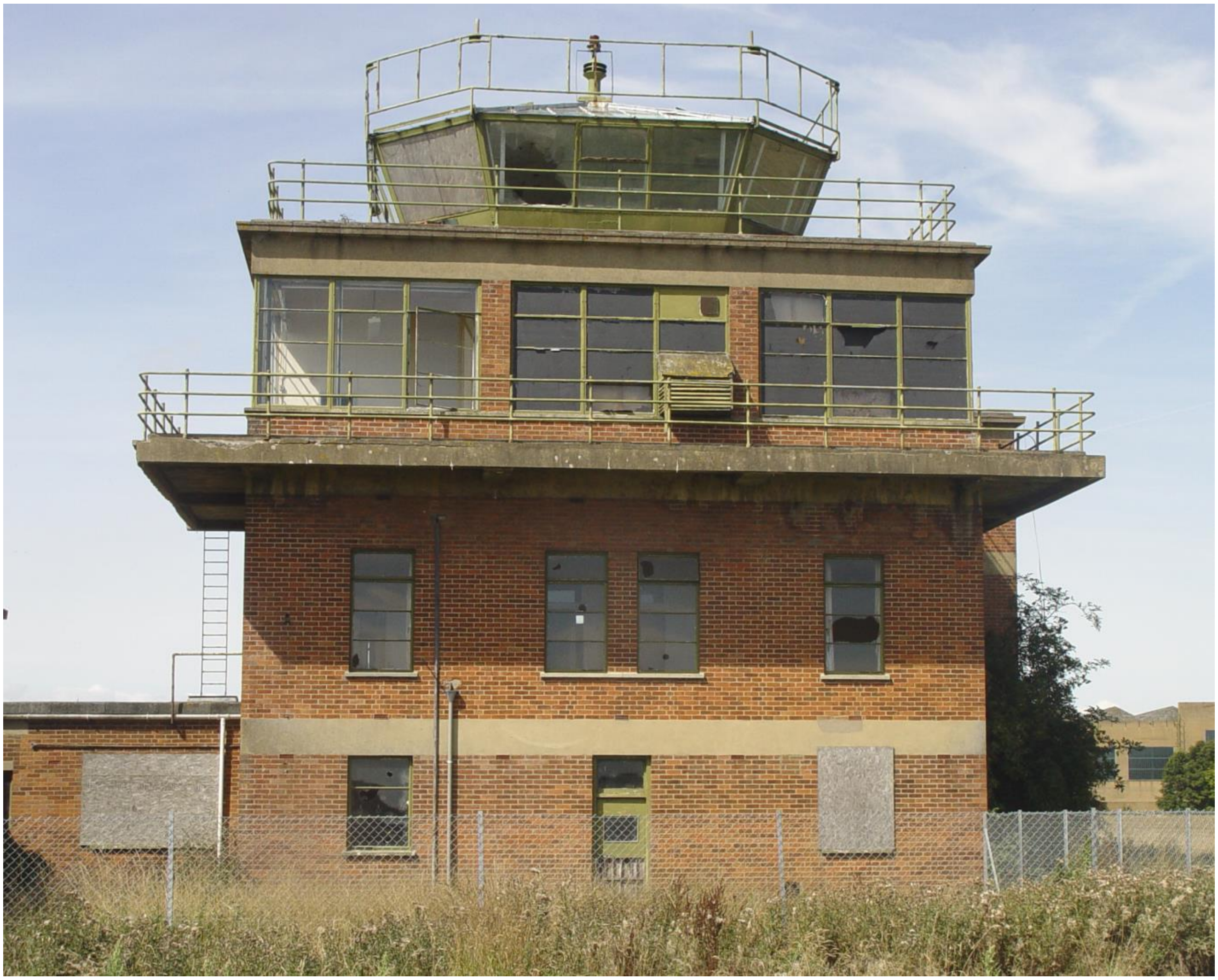

Plate 2: The VHB Control Tower at RAF West Raynham

Front cover: The VHB Control Tower at RAF Lakenheath

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Preface

This report was commissioned by English Heritage, it is an examination of four military buildings of a type known as Very Heavy Bomber Control Towers, built at four sites in East Anglia at RAF Lakenheath, RAF West Raynham, RAF Sculthorpe and RAF Marham. The survey was carried out by Paul Francis during August 2005. Out of the four sites RAF Marham has the only building that is still operational as an ATC building, all of the others are derelict.

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Acknowledgements

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Copyright Statement

Paul Francis is recognised as the author of this work 2005

Part 1 Notes on Sources & Methodology

1.1 Notes on Sources

Primary sources on Very Heavy Bomber Stations are preserved in fairly small numbers within The National Archives (TNA) (formally the Public Record Office). These form part of a much larger collection of documents relating to RAF Stations. The operational record books (ORB) for the four stations are informative but are limited in their content on policy, design and construction. The RAFM has a small number of airfield site plans relating to VHB stations and one of these showing Lakenheath has been redrawn for this report. The museum has only one copy of a relevant building drawing but this has proved invaluable.

1.2 Methodology

All four aerodromes were visited, the exteriors of each control tower were viewed and photographed and an attempt was made to locate and record other structures that were associated with the VHB Control Tower. All three derelict buildings were viewed internally and notes taken about their condition, fittings as well as location both within the immediate area and the airfield landscape and infrastructure. The building at RAF Marham is located within a sensitive area and could only viewed within its immediate context.

Part 2: Very Heavy Bomber Stations

2.1 Introduction

Towards the end of WWII there were several airfields required for special purposes and for which particular specification of lay-out and construction was necessary that went beyond the existing operational requirements. Aircraft companies in the UK and America were designing a new breed of very heavy bomber and transport aircraft that would require runways in excess of the normal Air Ministry Class 'A' operational airfield specification.

Airfields for very heavy bombers were therefore, planned with three runways - the main runway at 3,000 yards by 100 yards and subsidiaries 2,000 yards by 100 yards. Strip widths were 400 yards and 200 yards respectively. At each end of the three strips the ground was prepared for a distance of 200 yards to allow for overshooting.

From the middle of 1944 three RAF airfields (Marham, Lakenheath and Sculthorpe[1]) closed for reconstruction to the new standard now known as 'Very Heavy Bomber' (VHB) stations. One other airfield was also closed (in 1943) for reconstruction to the same specifications but was classified as a Very Heavy Transport (VHT) station, required by RAF Transport Command in support of the Japanese conflict - this being Heathrow. After a design change, where the development was pushed further north in order to miss the Perry Oaks sludge disposal works; George Wimpey Ltd began construction of Heathrow on 1 June 1944.

Marham re-opened in January 1946, Heathrow in May 1946[2], Lakenheath in August 1948 and Sculthorpe in December 1948 - the last two formed as self-accounting stations to administer a Heavy Bomber Group for USAAF/USAF. While construction was still taking place at these three sites, others for VHB stations were under review including Alconbury and Mildenhall but despite site plans with the new runway arrangement being drawn up, these two were never developed to this wartime standard.

The VHB airfields were initially designed (in April 1944) for the proposed Vickers Windsor and the B-29 heavy bomber. At this time the sites were inspected and plans prepared but additional land had not yet been purchased. Apart from the VHT and VHB Control Towers, there were no other buildings specifically designed for these stations, relying instead on prefabricated Uni-Seco huts for dispersal accommodation, married quarters and other domestic and technical requirements.

This arrangement was fine for RAF occupation but as soon as the stations were to be occupied by USAF units, so buildings and structures began to be introduced that were built to American specifications.

After 1950 the Air Ministry works department were engaged in designing new buildings specifically for VHB stations (such as the Z-form two-storey barrack blocks at Sculthorpe) and aviation fuel installations. These were designed and built to American specifications but the majority of buildings and structures were imported from the United States. The most common of these is the Butler Shed - a steel-framed building that could be erected in any length or as a multi-span shed.

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[1] It is interesting to note that the historic Brazen Hall had survived the construction of WWII RAF Sculthorpe but had to be demolished for the airfield's reconstruction.

[2] London Airport was officially opened on 31 May 1946 but at this time only the main runway with one parallel taxiway was ready for use.

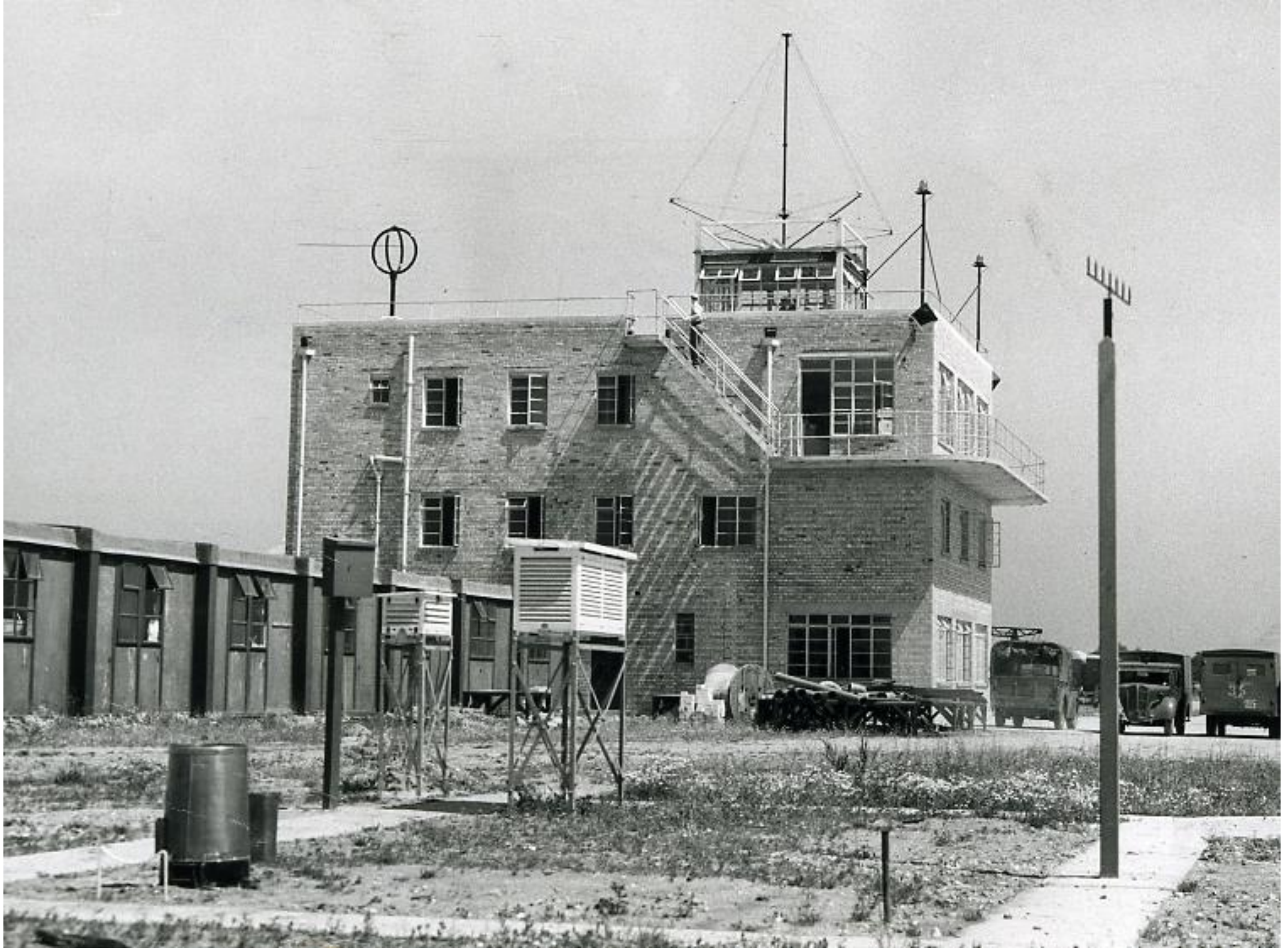
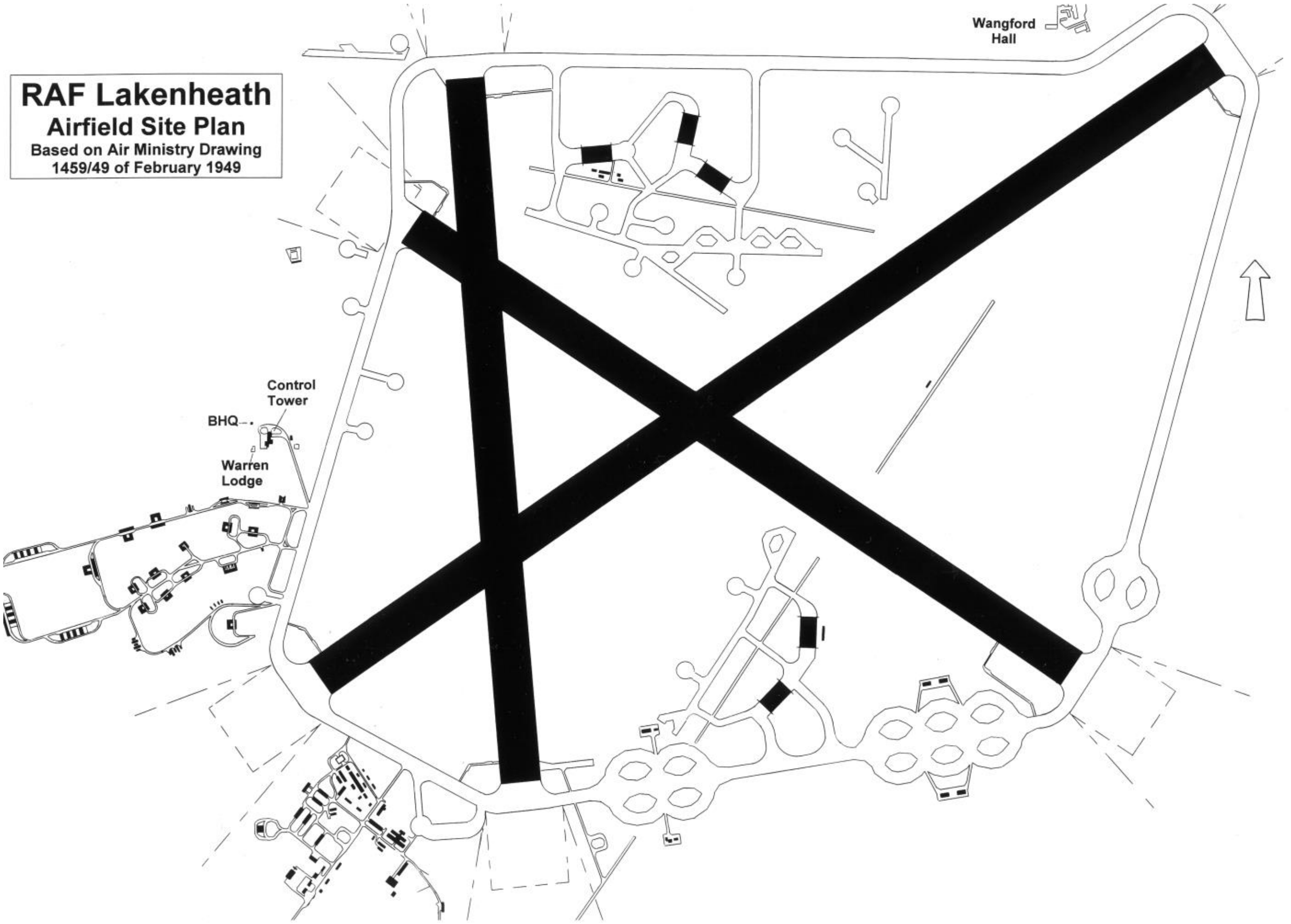


Plate 3: The three-storey VHT Control Tower at Heathrow c.1948. The design pre-dates the VHB one by about a year. Note the airfield control room on the roof and the Uni-Seco Customs building on the left - Photo: British Airways



At the initial design stage a VHB station (on paper) consisted of the extended runways and perimeter track and medium bomber hardstandings. This was further developed into a new type (1348/50), designed for parking heavy bombers. Both of these were based on the second generation of bomber aircraft hardstanding known as the 'Spectacle' type constructed during WWII, but the new versions are considerably larger. They were designed so that parked bombers with large wing spans would have a clearance of 150ft from a similar aircraft using the perimeter track which the old style versions would fail to do. The 1950 specifications called for parking of a minimum of 30 aircraft and in USAF parlance, a single heavy bomber hardstanding is termed 'SAC Bubble'. The VHB specification as agreed with USAF 3rd Air Division during 1950, also called for at least 360,000 gallons of AVGAS, five Nose Docking Sheds and at least one 350ft by 210ft warm-up apron. The provision of a secure Bomb Stores was a specification issued in August 1951.

Runways had between 10 and 12 inches of high-grade concrete on consolidated and stabilised foundation. The total area covered by three runways was between 1,010,000 and 1,050,000 square yards and involving between 26,000 and 38000 square yards of road diversion. The costs involved for each of the three VHB sites was £1,673,000, £1,740,000 and £2,120,000[3]. Each site took around eighteen months to complete involving between 1,035 to 1,120 men at each site.

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[3] It is unknown which figure represents what VHB station - source The Civil Engineer in War Volume 1: Airfields

By the time the last of the VHB stations had opened the WWII VHB designation had become obsolete and was replaced by the Class I programme.

There were two other stations that featured VHB and VHT Control Towers but were never developed to the standard of the three runways. These are St Mawgan and West Raynham, the former had a VHT Control Tower while the latter had a VHB type building. It is unknown why these two stations were equipped in this way. George Wimpey had begun construction of West Raynham's runways in May 1943 and today the runways are still at their 1944 design length. The choice of a VHB Control Tower may have had something to do with the post-war importance placed on the Central Flying School which arrived there during September 1945 - this would coincide with the construction of the new building.

Marham was the only one of the VHB stations that had a permanent camp, the others were based on WWII satellite stations and initially only had temporary accommodation in the form of 89 Nissen huts at Sculthorpe and 63 at Lakenheath. These had been unoccupied since the stations had closed and by the time they re-opened the huts were damp and in a poor state of decoration.

In the end the Windsor bomber was cancelled leaving the Lincoln bomber (and later the B-29) as the first very RAF heavy bombers that potentially could use the VHB stations.

The Lincoln aircraft had been designed under war conditions without anti-corrosion treatment and it was essential that this aircraft type should be kept inside hangars in order to maintain serviceability. The problem at Lakenheath was that due to the extended runways and lengthened perimeter tracks to meet the VHB standard, the airfield now had even greater dispersal which instead of being an asset, caused many operational problems. The station had three T2 hangars on the north side of the airfield which had been erected during WWII for the storage of Horsa gliders. These were now in an awkward position and were served by old sections of narrow perimeter track that were now cut off at one end from the new wider track. It was proposed to dismantle these and move them to the technical site - but this never happened. The technical site originally had a T2 hangar of its own but this had to be removed as it was within a runway strip area so its base became a parade ground. Further north there was another T2 and a B1 hangar positioned close to each other which were going to be used for repair and inspection but only the B1 was fitted with rails set into the ground for side-tracking the Lincoln in order to get it into the hangar. The situation was most unsatisfactory and Lakenheath and Sculthorpe were therefore, declared totally unsuitable for servicing four squadrons of Lincoln bombers. The lengthened perimeter tracks had resulted in a heavier increase of personnel and MT vehicles and the stations were therefore considered only suitable for emergency uses.

2.2 The First USAF Emergency War Plan (EWP) Airfields

In this background of unsatisfactory post-war airfield modernisation at a few RAF stations, USAAF presence in peacetime UK was quite small. This however, was about to change as a result of the belief that Soviet Russia presented Europe and the US with an ever increasing military threat - known in more recent times as the beginning of the Cold War. The deteriorating situation with Russia meant that from June 1947 USAAF had placed Strategic Air Command (SAC) B-29 Superfortress wings into occupied Germany for periods of operational training, but it was soon realised that the UK offered their B-29s better security than airfields in Germany. Then came the Russian blockade of Berlin and this act signalled the start of another major presence of (the now independent) USAF personnel in Britain. Two SAC Bomb Groups made up of six squadrons (of 60 aircraft) arrived in the UK for the RAF Bomber Command airfields at Marham, Waddington and Scampton. Of these only Marham was suitable (the B-29 required a strong runway with a length of 8,000ft and adequate hardstandings for parking). A third SAC Bomb Group was due to arrive in the UK during August 1948 and for this the new VHB station at Lakenheath was made available. American B-29s were to be deployed on a temporary duty (TDY) basis for periods between two to four months.

Meanwhile, as a result of the successful outcome of the Berlin Airlift, most of the B-29 squadrons were gradually withdrawn from the UK with Waddington and Scampton being handed back to the RAF. By early 1949 the VHB station at Sculthorpe had re-opened which now made a total of four major airfields in the UK either under SAC control or as a lodger unit – Burtonwood (support base), Lakenheath, Marham and Sculthorpe - the three original VHB stations.

The RAF had meanwhile, required VHB bases of its own for the interim (B-29) Washington fleet and there were still only three stations capable of handling them but these were still occupied or part-occupied by SAC units. By the end of January 1950 it was agreed that Marham should be shared until the RAF's Washington fleet was of sufficient strength when the USAF would vacate the site. By now USAF also required four permanent new bomber stations to be sited in the southern Midlands, identified as Brize Norton, (the headquarters) and three others at Upper Heyford, Fairford and Greenham Common.

2.3 Midlands Group

By now the US Government were in discussions with the British Government for the creation of the EWP Midland SAC bomber airfields with an agreement being reached by April 1950. This paved the way for reconstruction of the former WWII airfields, firstly beginning in June at Brize Norton, Upper Heyford and Fairford, followed by Greenham Common almost a year later.

The reconstruction of Fairford and Greenham Common and to a lessor extent (in the initial stages) of Brize Norton and Upper Heyford, involved a completely new planning arrangement to the traditional WWII and subsequent post-war VHB three-runway design. Instead of three runways, a single 9,000ft by 200ft runway was planned either aligned along the existing (E-W) main runway, or in the case of Greenham Common parallel to it. This was to be served by two 80ft wide 'high-speed' taxiways running parallel with it (N and S) and from which were other tracks leading to aircraft hardstandings to accommodate up to 45 aircraft. Runway length which had been debated by the British and US Governments had originally been set at 8,000ft (adequate for the B-29), quickly followed by 9,000ft (for the B-36) but during 1952, in order to cope with new B-47s then under construction it was amended to an 'ideal' nominal length of 10,000ft (SAC actually wanted 11,300ft but accepted 10,000ft)[4]. Where possible another 1,000ft over-run at either end was also to be allowed for.

These airfields were also classified as VHB stations but their design was a natural progression from the WWII VHB arrangement. The original plans included the modern design of a single runway but retained the old idea of having hardstandings based on maximum dispersal. This was then changed to a more compact layout, designed to cut down the time in getting aircraft to the high-speed taxiway and this became the standard for all future bomber and fighter stations. It was at this design phase that led to the new SAC bubble type for very heavy bombers (such as the B-52). These were built from 1951 at the new Midlands group airfields as well as the old VHB stations.

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[4] 10,006ft Brize Norton, 9,997ft Fairford, 10,010ft Greenham Common, 9,604ft Upper Heyford

2.4 The VHB Control Tower

2.4.1 Introduction

Since 1926 and until 1965 there have been ten different designs of Watch Office and Control Towers for RAF bomber stations. The VHB Control Tower was designed in the same month as the war in Europe ended (May 1945), it can therefore said to be the last design of WWII and the only one designed and built within the transition period between WWII and the Cold War.

The building is number six within the development sequence of RAF Control Towers, it is the first to be designed with a Visual Control Room (VCR) for local control and the first to be self-contained with ambulance, crash tender and night flying equipment store within the same building.

2.4.2 Room Layout - As Designed

The main entrance is at the rear of the building, set within a single-storey lobby this gives access to the hall and stairwell. There is a central corridor leading off the main hall with rooms on both sides that mainly accommodated the building's plant services although a large room was a visiting crew room. The three-storey stairwell annexe gives access to all floors including the roof.

The first floor has various offices, but the main ones are the forecast room and an operations room. The second floor was originally arranged mainly open-plan and functioned as the approach control room while the VCR on the roof is for the local control of aircraft. From the approach control room it was possible to get access to the VCR via a ladder.

The VCR is of unique design and is a development from the airfield control room[5] or signaling pent house as provided on top of some watch offices during WWII. The structure is steel-framed with angled RSJ beams bolted into a cant-sided octagonal plan-form. It is essentially a glass house with metal-framed double-glazed panels fixed above dado height panels of mild steel sheeting. The angled glass keeps glare to a minimum. The centre upper windows are top-hung opening sashes but are very heavy and cumbersome to open. The roof is also glazed, each section consisting of seven sheets of thick-section plated glass but the roof glazing is often hidden behind a false ceiling of acoustic tiles. The VCR was furnished with the controller's desk and airfield lighting control panel. A steel sliding door gives access to the roof of the building.

The VCR measures 20ft 6in across flats and has a ceiling height is 8ft 6in.

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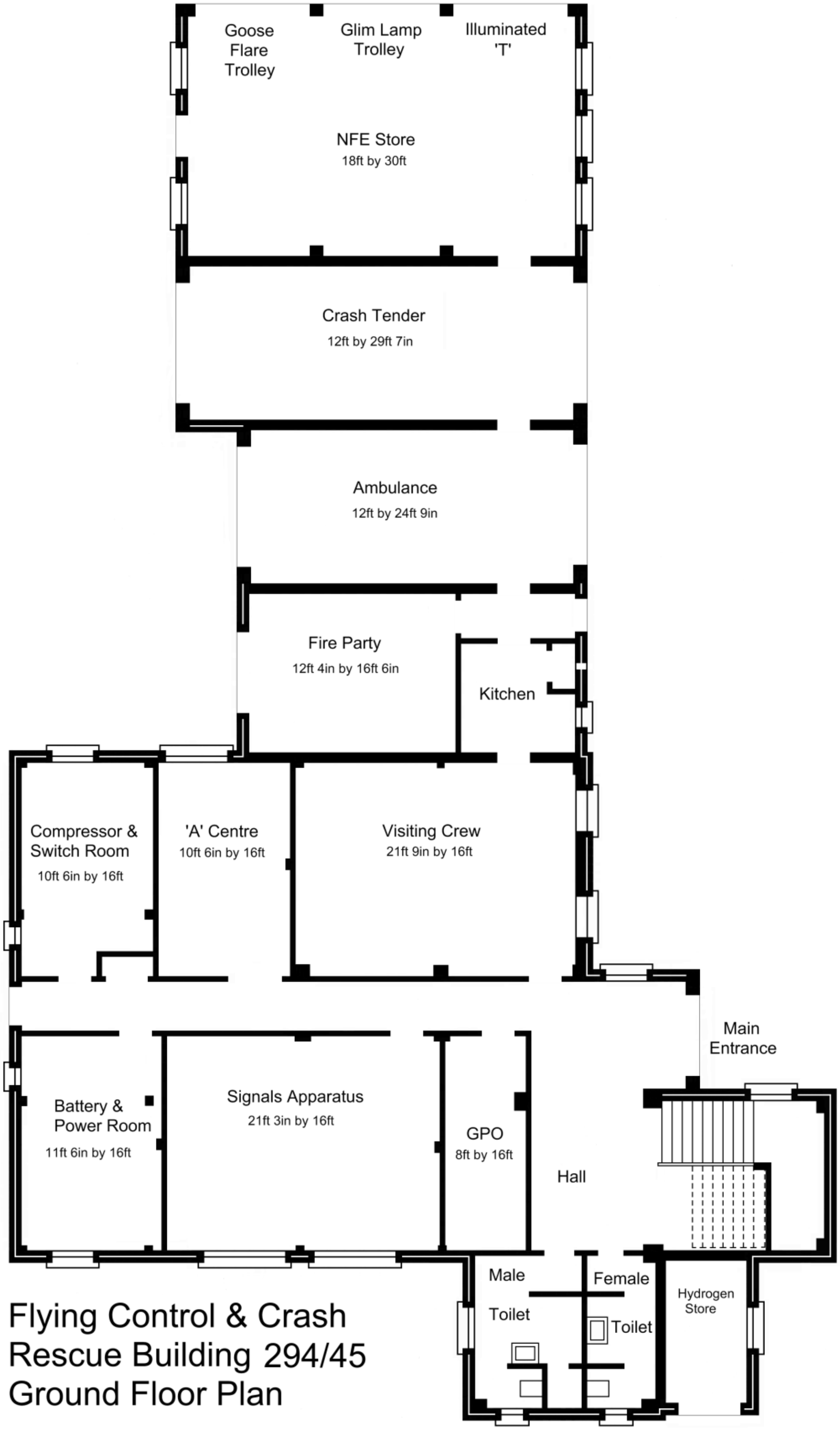
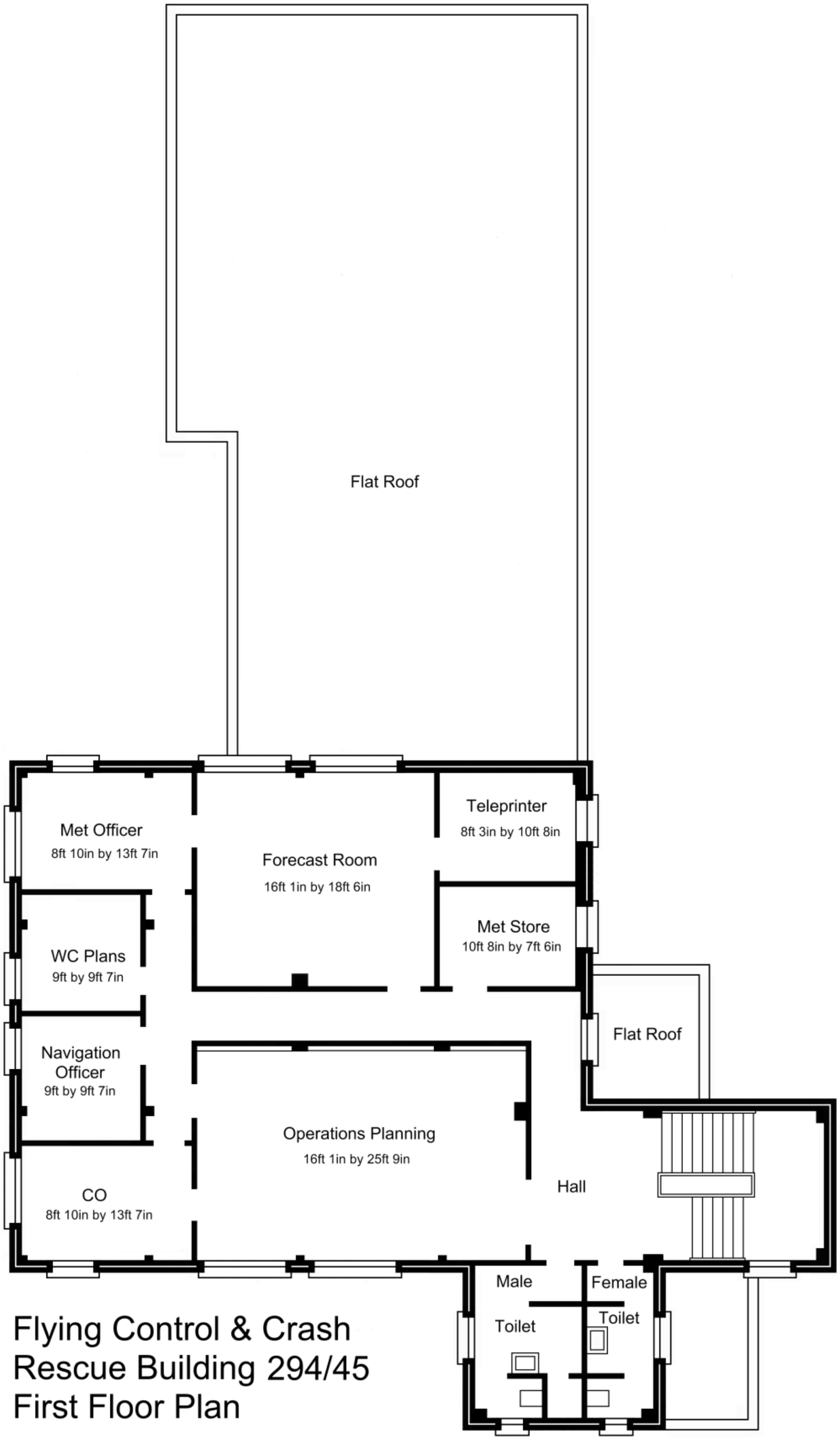
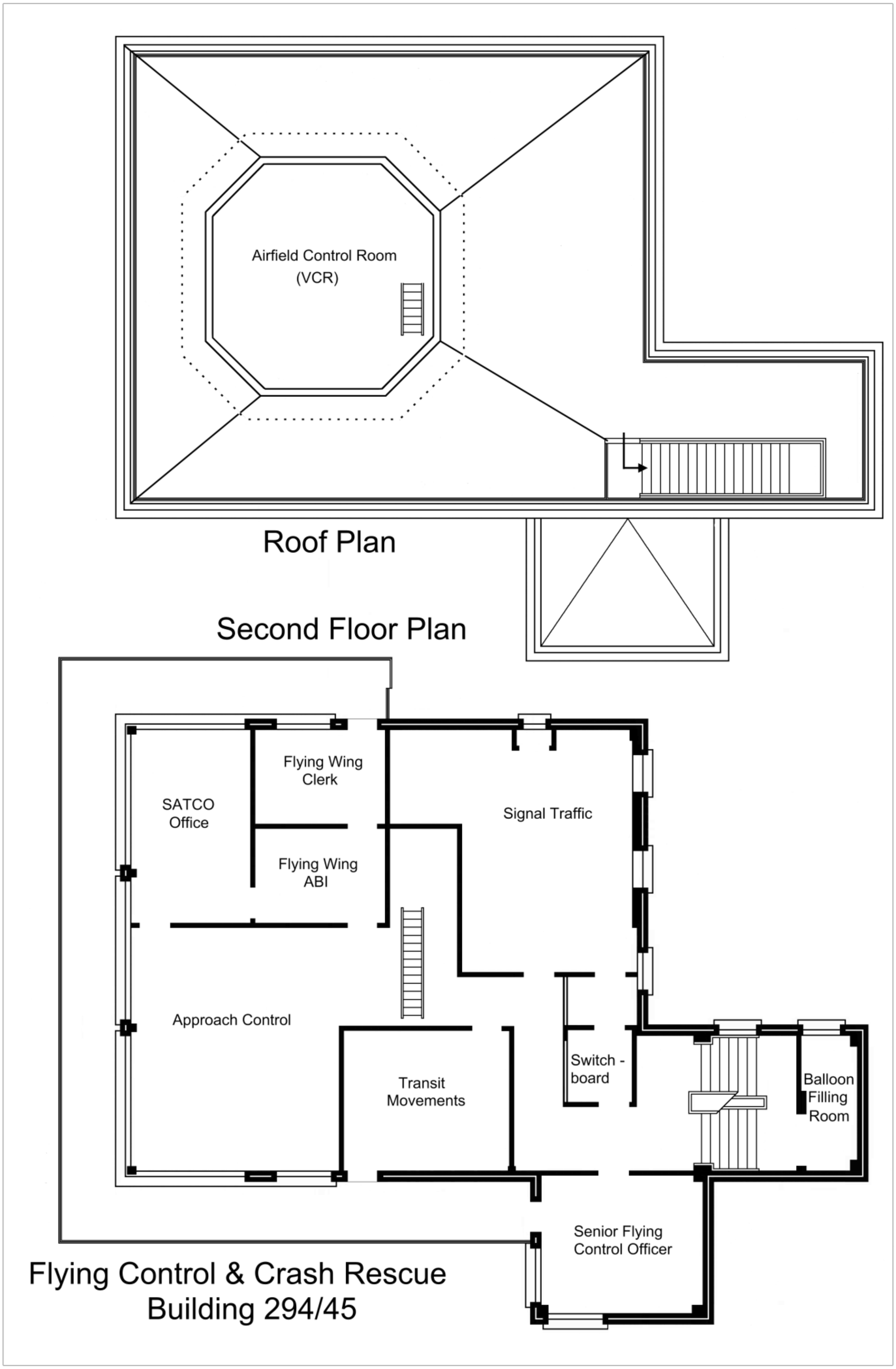
[5] The change in name from Airfield Control Room to Visual Control Room came about c.1955 but for consistency the term VCR is used here.



Flying Control & Crash Rescue Building 294/45 Ground Floor Plan



Flying Control & Crash Rescue Building 294/45 First Floor Plan



Roof Plan

Second Floor Plan

Flying Control & Crash Rescue Building 294/45

2.5 RAF Lakenheath

Built at 68ft HSL, on a site close to the site of Warren Lodge and the WWII bomb stores, the complex is aligned N-S but the main building faces east allowing a commanding view of the airfield. Close by and on slightly higher ground to the N-E is the WWII Battle Headquarters (BHQ) while in front of the building is the airfield code letters and ground-to-air signals base. Beyond the signals base, set into the ground and close to a perimeter track is what appears to be a WWII light anti-aircraft position which presumably is there as part of the defences protecting the BHQ. There is one other structure of interest, which is a pre-cast concrete modern-style pillbox that is positioned close to the north boundary fence. The only other above-ground features are the foundations and floor bases of demolished Nissen huts and other buildings as well as the foundations of an aerial tower.

The main building has a rectangular-shaped plan-form with a full-height projecting stair well along the west elevation and a ground floor ablution annexe. The structure rises to three stories terminating with a flat concrete slab roof that supports a first generation steel visual control room fixed over the front section of the building. The VCR is at 104ft HSL and has 360-degree views of the airfield and the countryside beyond. Extending at ground floor level on the north side elevation, is the night flying equipment (NFE) store, ambulance and crash tender garage. The NFE end has been extended further north, presumably to accommodate the larger American fire appliances or other vehicles. This elevation does retain the original roller shutter doors (which have been re-used) these are fitted to the extension.

The Lakenheath building plan-form is a mirror image to that shown on the original general arrangement drawing (294/45).

The building is based on a steel rectangular grid of 22 stanchions with interconnecting cased cross beams arranged to suite the internal wall division and to carry the weight of the floors and VCR. All steelwork was supplied and erected by Dorman Long and Co Ltd. External wall cladding is 11 cavity brick, the outside leaf being wire-cut rustic brown facing bricks. Guttering and down pipes are cast iron, one down pipe has failed which has resulted in a large vertical stain running down the stairwell on the NW side (see photo).

Internal walls are either plastered 4.5in brick or wooden stud walls - the room arrangement is different to the original drawing. Large areas of plaster (Carlite browning) have blown, especially on the ground floor within the entrance hall. Most of the plasterboard walls have been damaged by vandalism. All window openings have original steel multi-pane casements - many are boarded up. Floors are 5.025in thick reinforced concrete slab except the balcony which is 4.025in thick.

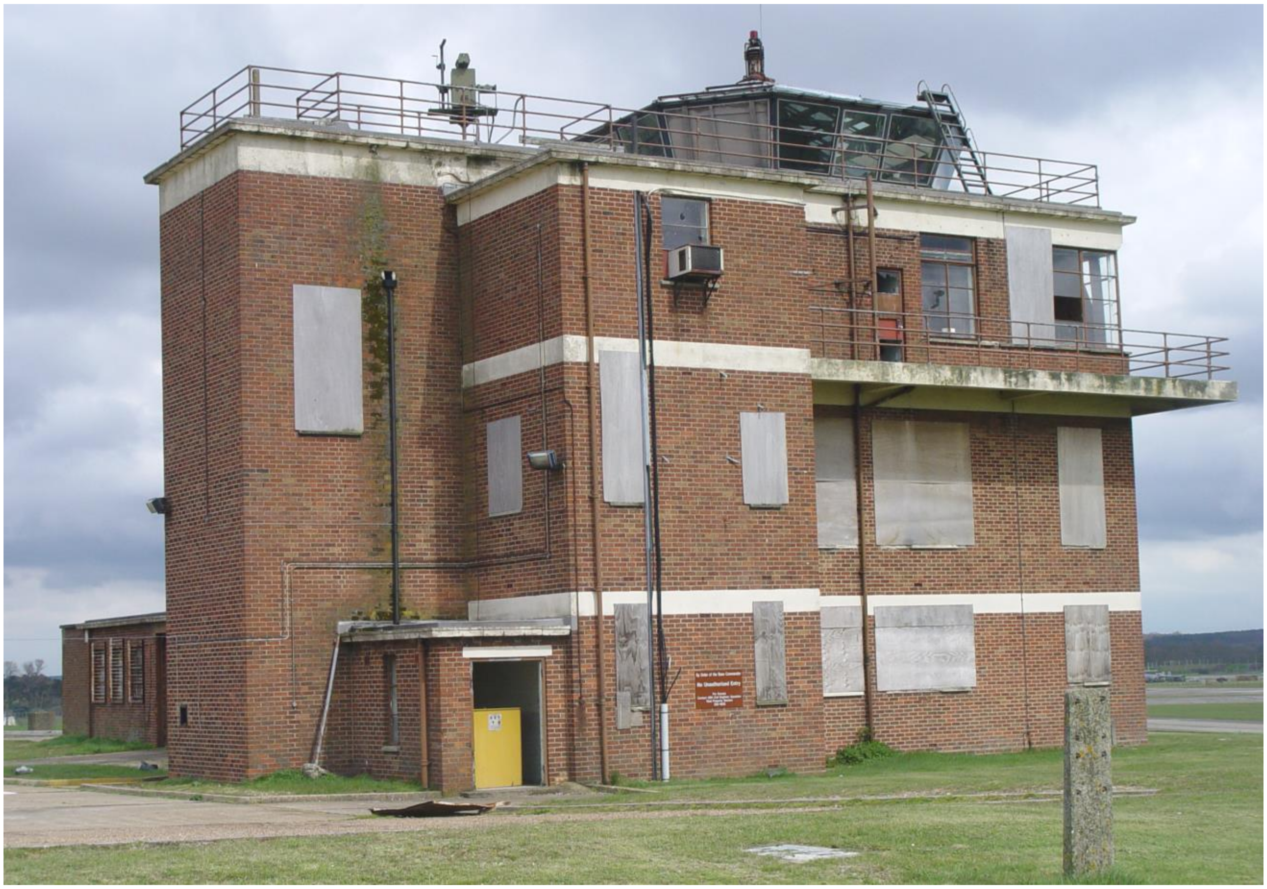


Plate 4: Lakenheath VHB CT - the door on the left is the hydrogen store

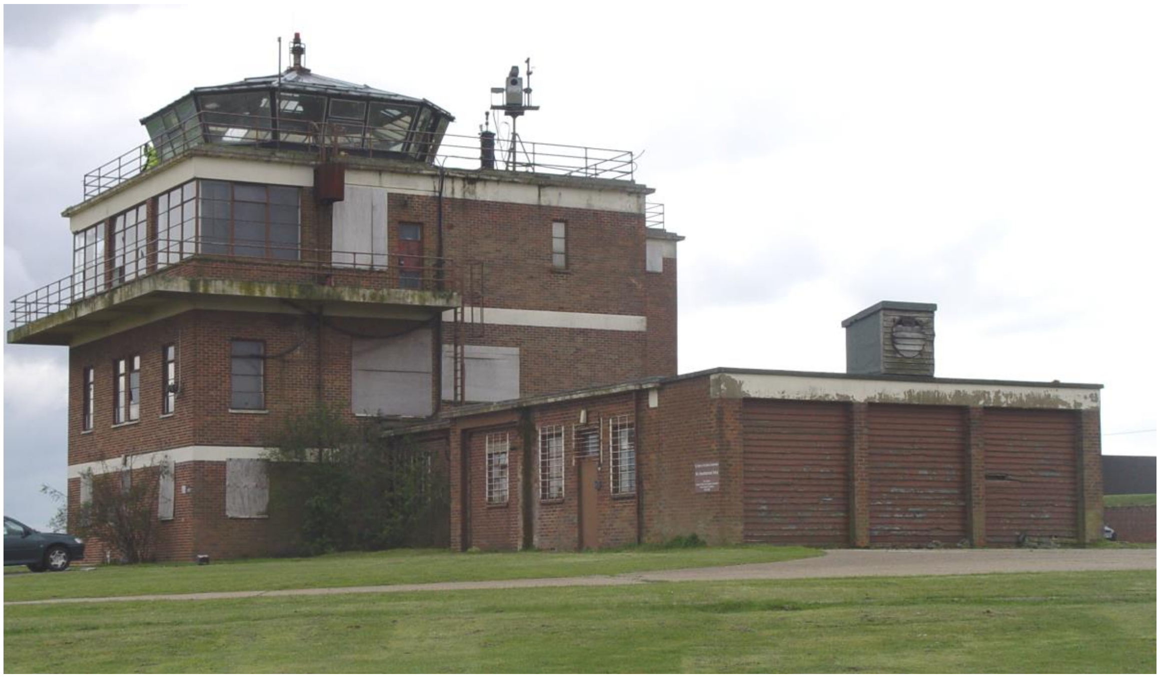


Plate 5: Lakenheath's VHB CT and NFE Store with its roller shutters

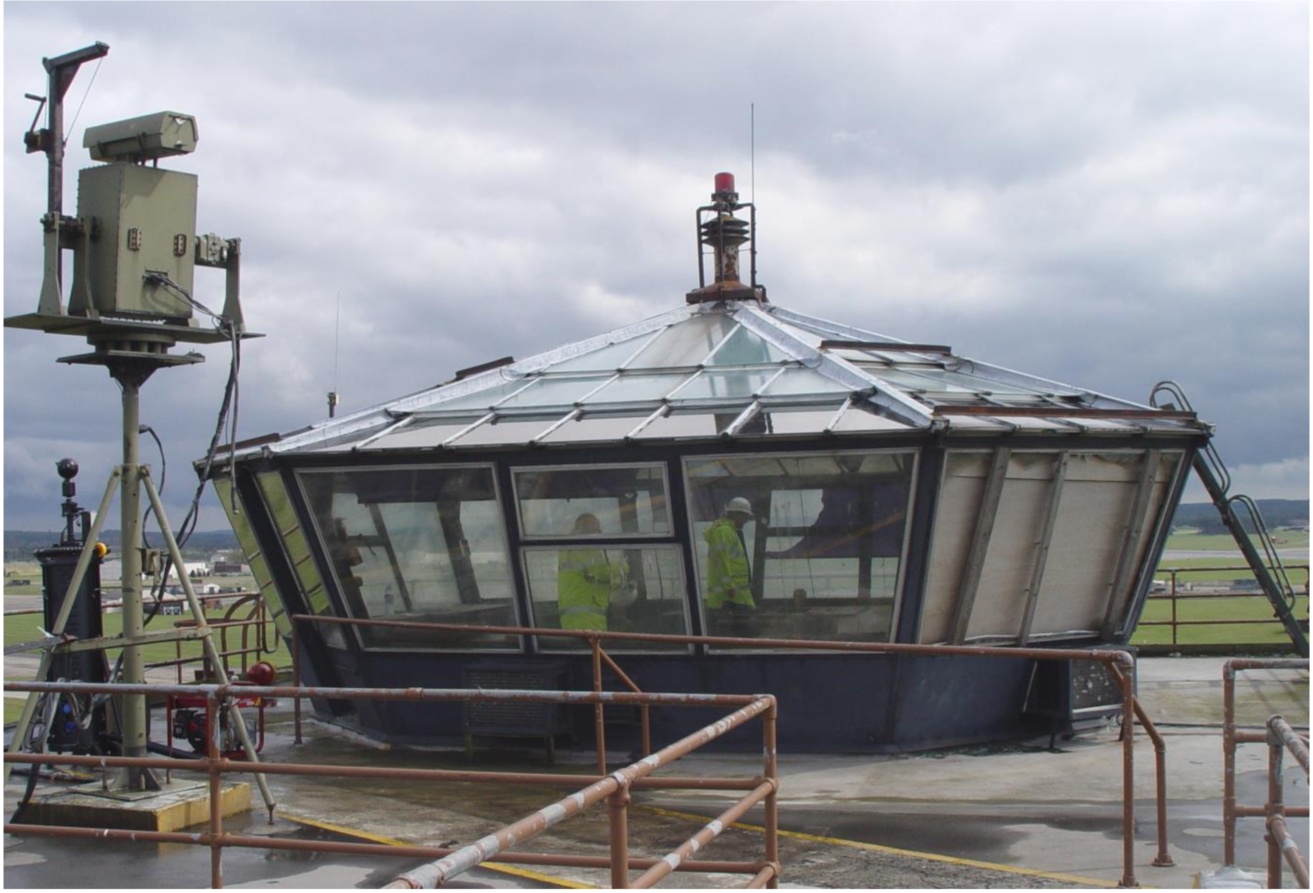


Plate 6: Lakenheath's VCR

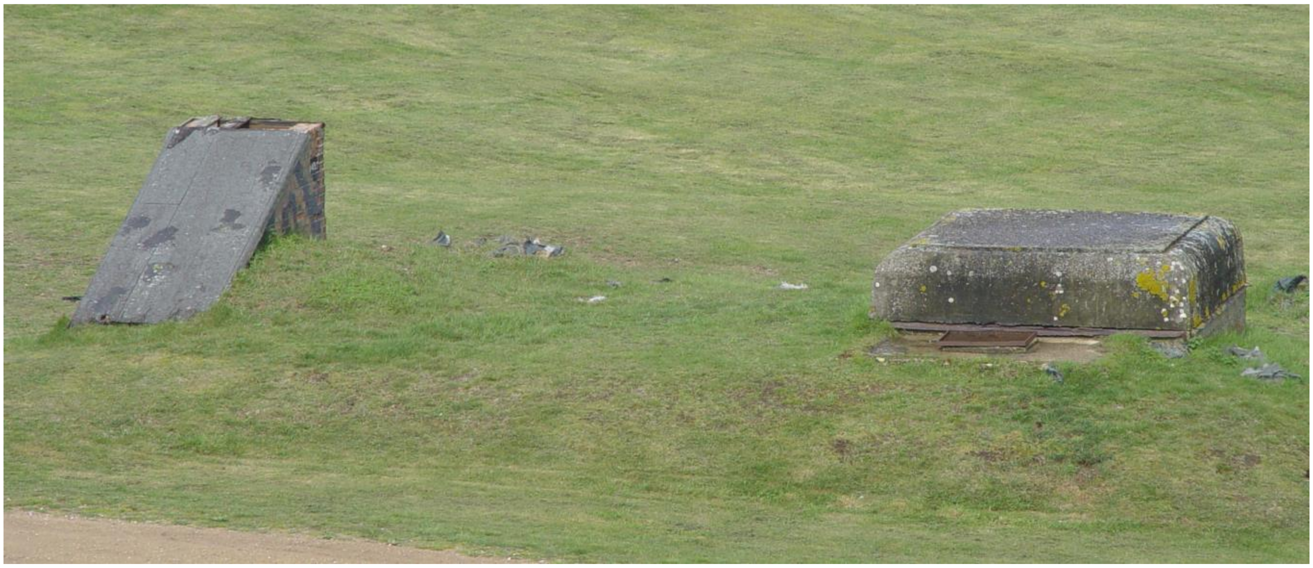


Plate 7: Lakenheath - the Battle Headquarters - a view from the Control Tower

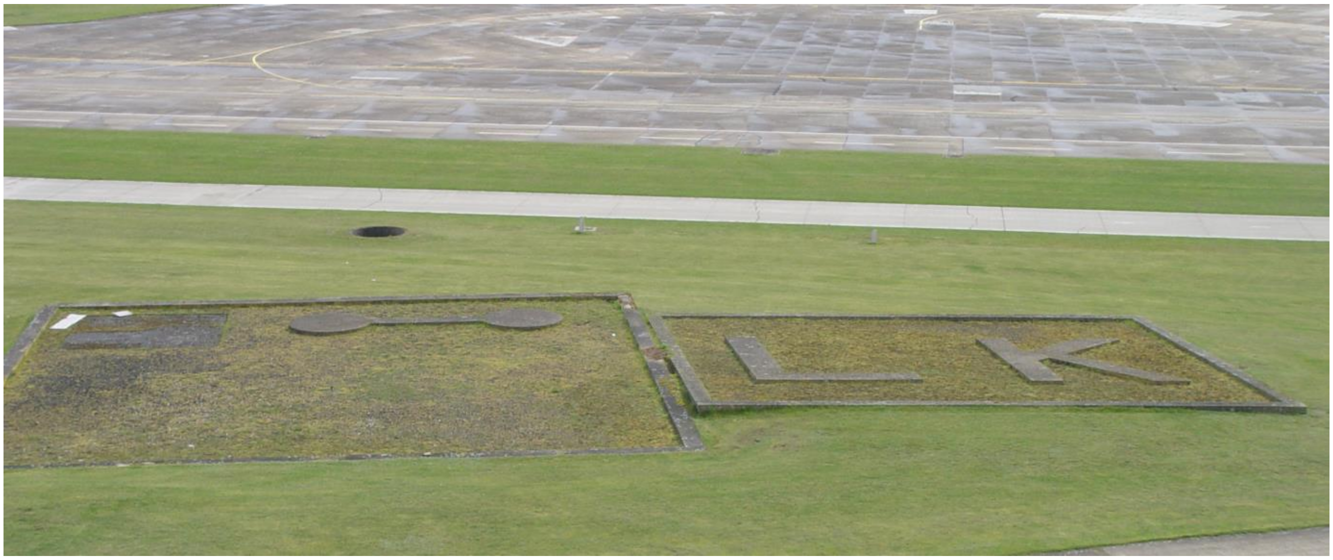


Plate 8: Lakenheath Signals Square and Airfield Code. Note the black circle before the road - this is the LAA position

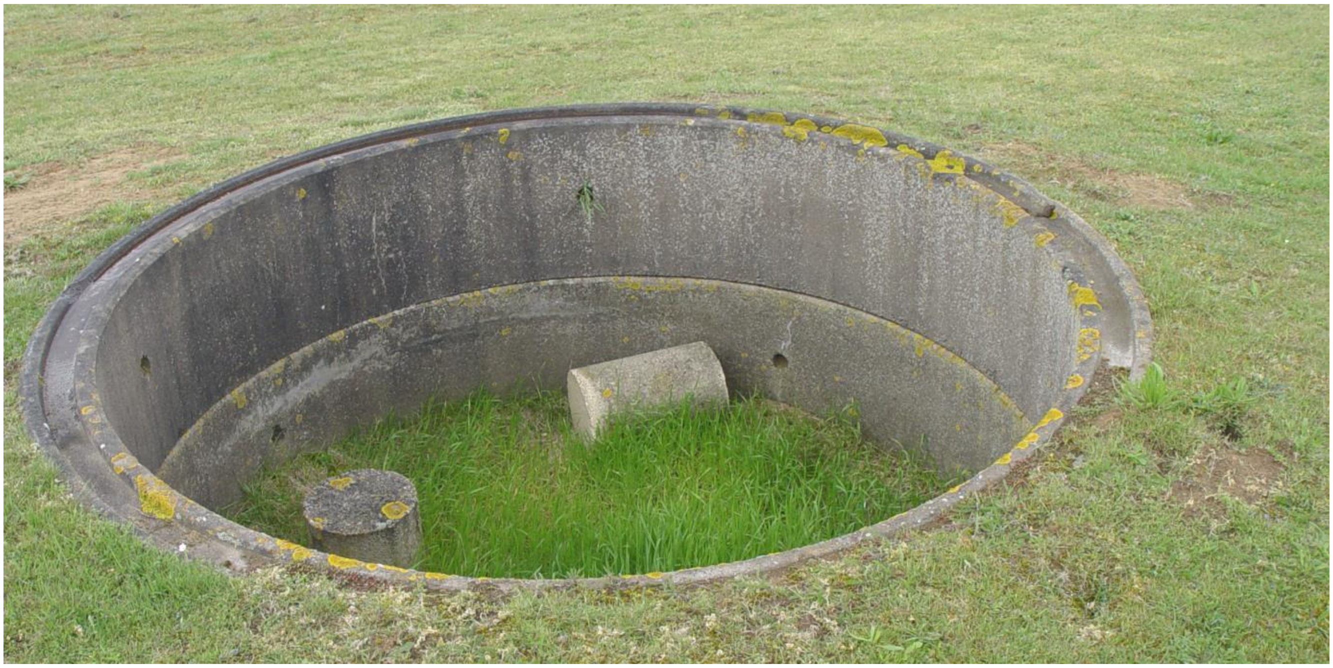


Plate 9: Lakenheath - a close-up view of the Lewis gun LAA Position

2.6 RAF West Raynham

RAF West Raynham is on the disposal list and will be sold in its entirety within this financial year. The camp is a near-complete RAF expansion Scheme F station[6] which has several buildings from later schemes and structures from WWII and the Cold War. As it stands today it is the best example of a pre-WWII RAF station in the UK. An important feature of the camp area is its 1937 hangar crescent with four Type C Aircraft Sheds and original Watch Office with Tower (the tower was removed 1943 and replaced with a control room). Other structures associated with this building are also present such as the Fire Tender Garage and NFE Store. The combination of having a full set of hangars and Watch Office with associated ancillary buildings and technical site is very rare feature of an RAF Expansion Period station in 2005.

The VHB Control Tower has been built as shown on the original drawing (294/45) with the fire station complex to the right of the main building (viewed from the rear). The building occupies an isolated position, beyond the hangar crescent and closer to the main runway. The VCR has excellent views of the airfield to the north and east and the hangar crescent with its large contemporary concrete Aircraft Servicing Apron to the NW. Other features are a signals square, the remains of the ground to air signals and a meteorological enclosure.

Since construction it has had a modern five-bay fire station built link-detached to the original one - this has been built onto the airfield elevation. The original fire station and NFE store has been converted into rest and barrack type accommodation for the fire party and as a result the main door openings of the original garages have been bricked up and windows inserted.

The internal partitioning is different to the original drawing but these are mainly stud walls. The main building is largely in excellent condition (but there are a few problems - see below). On the plus side the building has certain features that are not present at Lakenheath - these are the following:

- Pneumatic Lamson tube plant - the vacuum pump is extant in the former Met Office on the first floor and pipe work is in situ to all rooms that received a Lamson message service.
- The access ladder connecting the VCR with the Approach control room is in situ.
- Airfield lighting control desk and Controller's desk is in situ in the VCR.

The brickwork is sound, there are no obvious major structural defects, but the main problem is that the VCR is no longer watertight. A large portion of the roof is damaged allowing water to collect in the VCR and penetrate the floor - this has resulted in damage to the ceiling of the second floor. In addition some of the double glazing panels to the VCR have been smashed and parts of the steel frame show signs of corrosion.

Another obvious problem is that the steelwork supporting the balcony is showing signs of corrosion, all windows are present consisting of original steel casements but some have been smashed.

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[6] Constructed by the Norwich firm of F.R Hipperson who had just completed RAF Marham, when they won the contract for West Raynham.

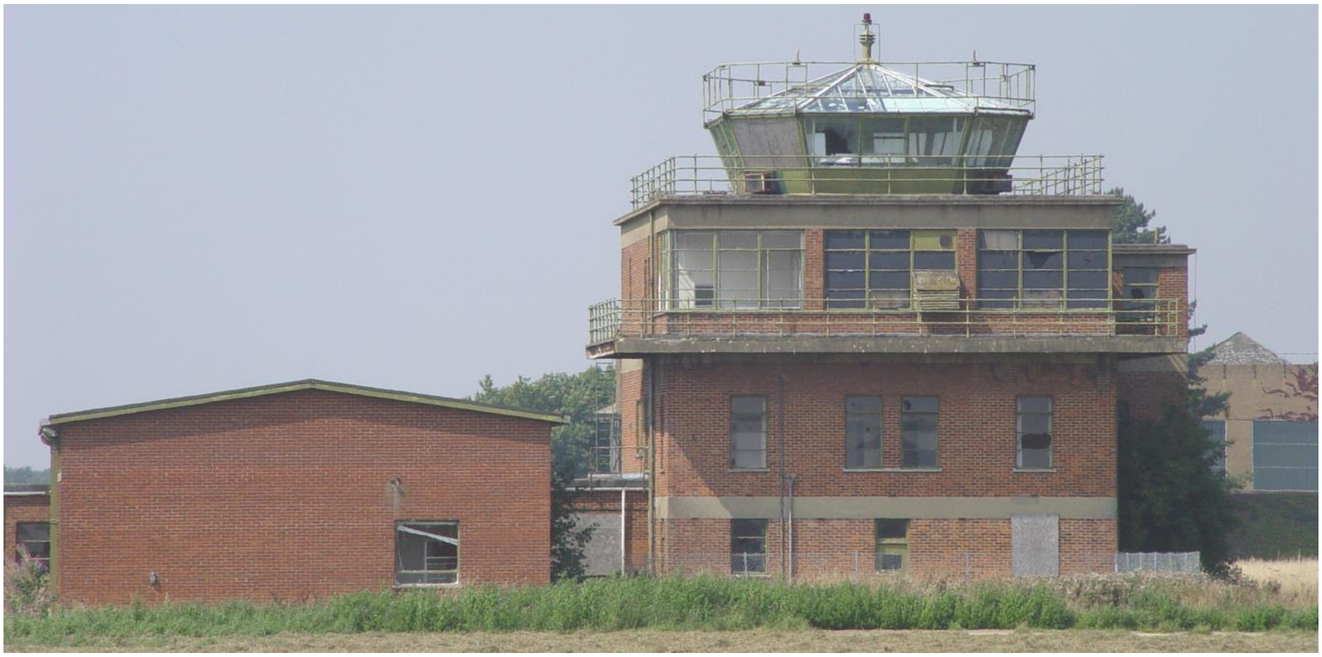

Plate 10: A view of West Raynham's VHB CT from the main runway

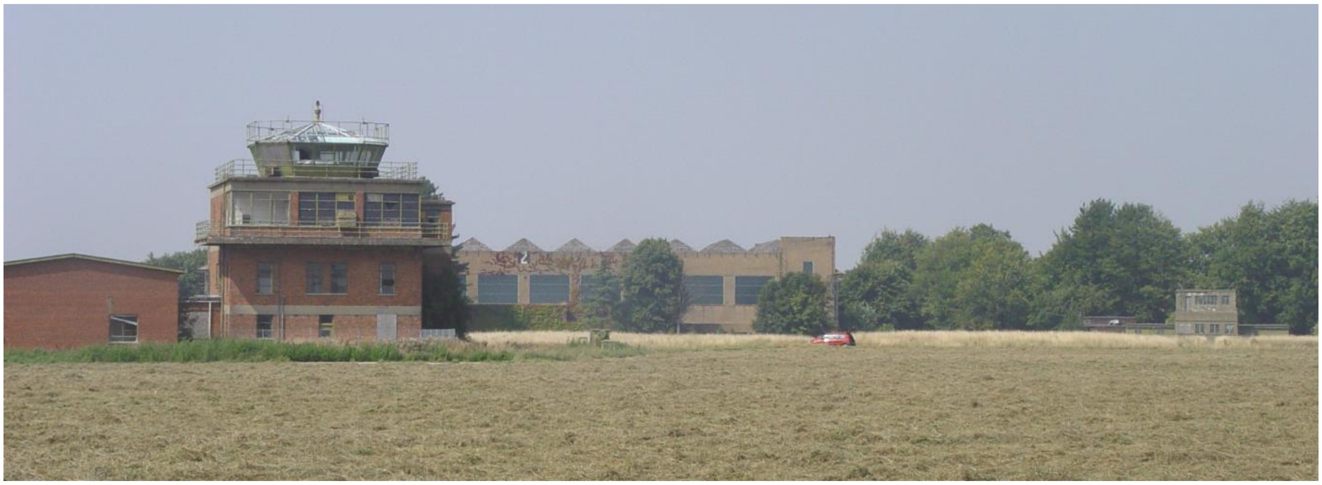

Plate 11: West Raynham - photo showing the earlier Watch Office (positioned on the centre line of the hangar crescent) with a Type C Aircraft Shed and the VHB CT

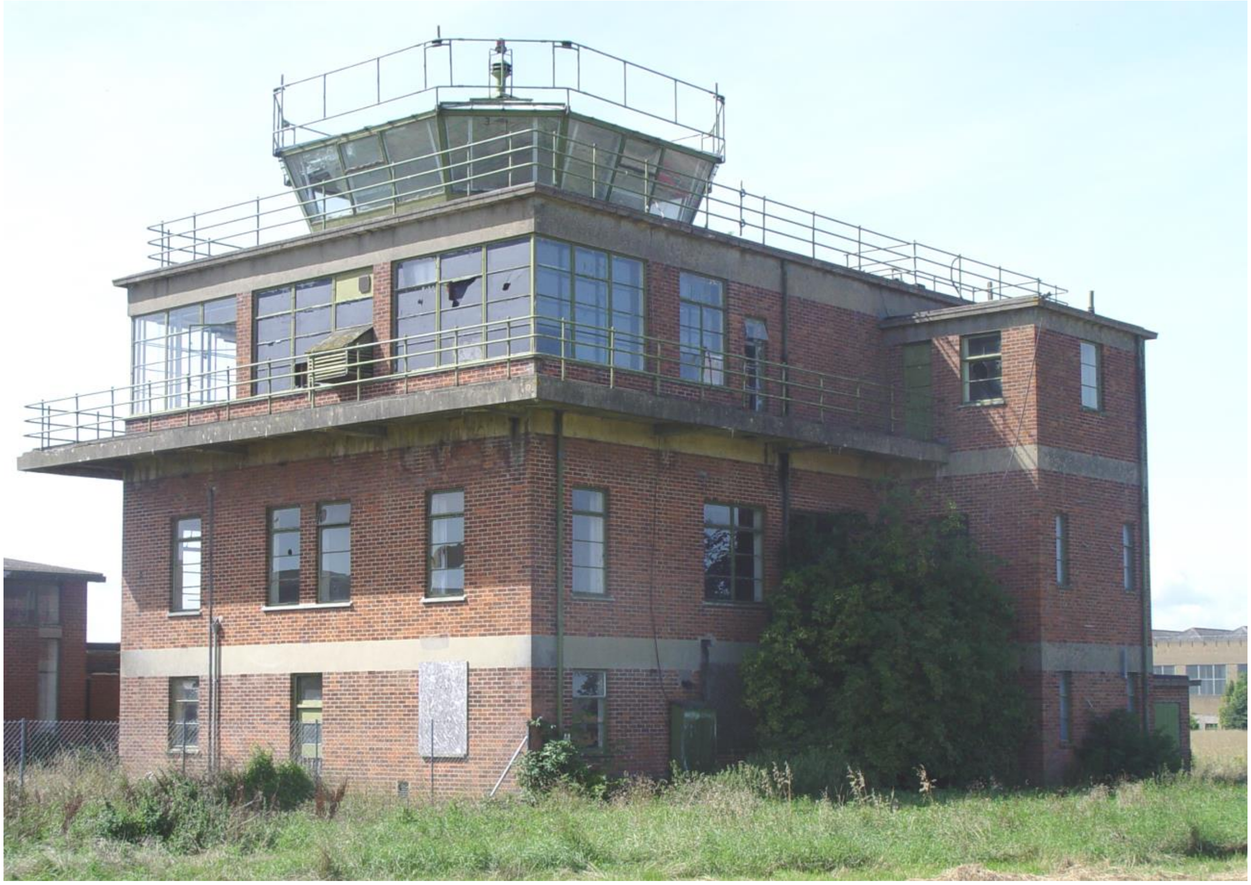

Plate 12: VHB Control Tower

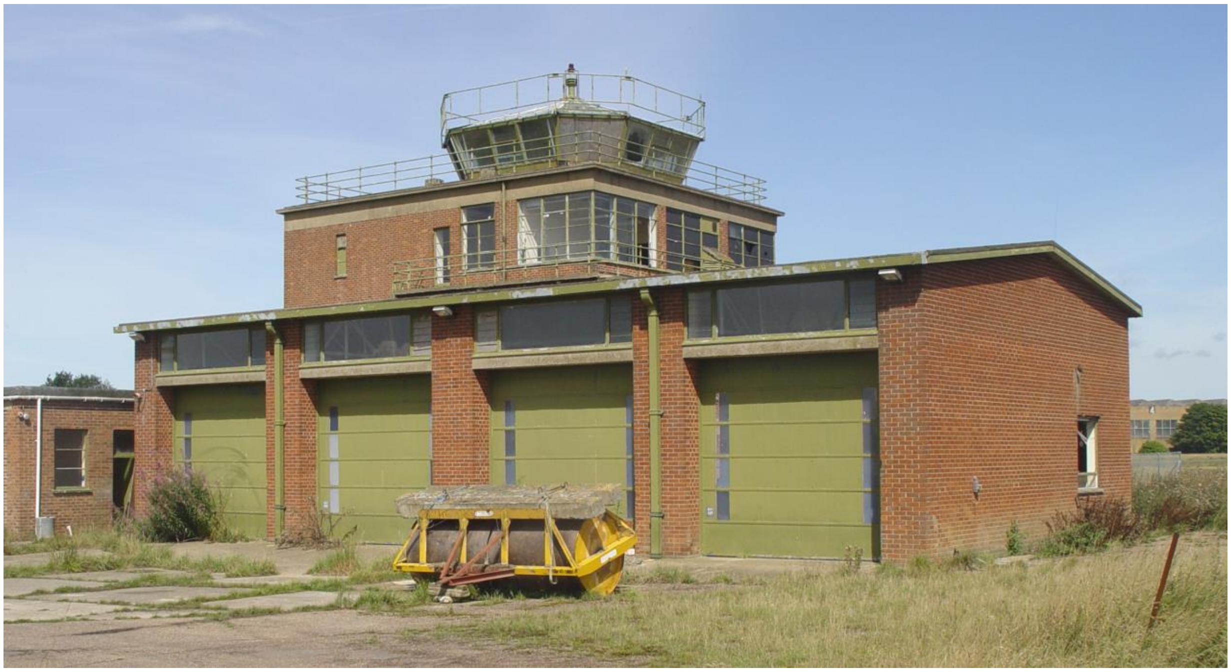

Plate 13: The Fire Station with VHB Control Tower behind

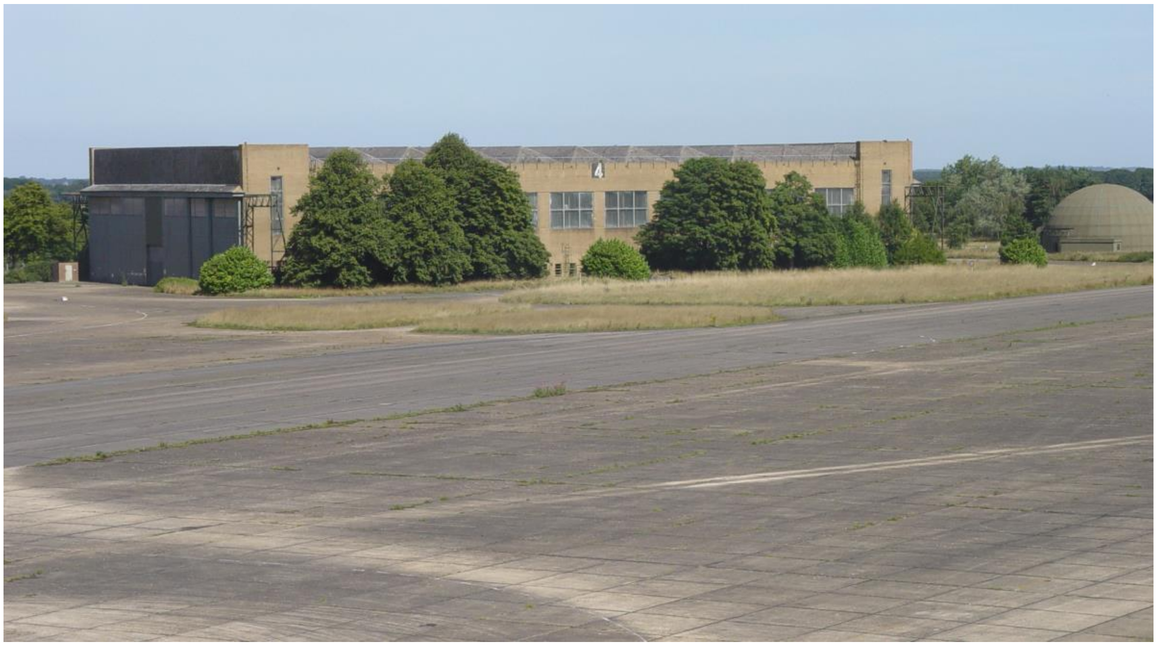

Plate 14: View from the VHB Control Tower showing a Type C Aircraft Shed, a Rapier Missile Training Simulator Dome and one of the Aircraft Servicing Platforms

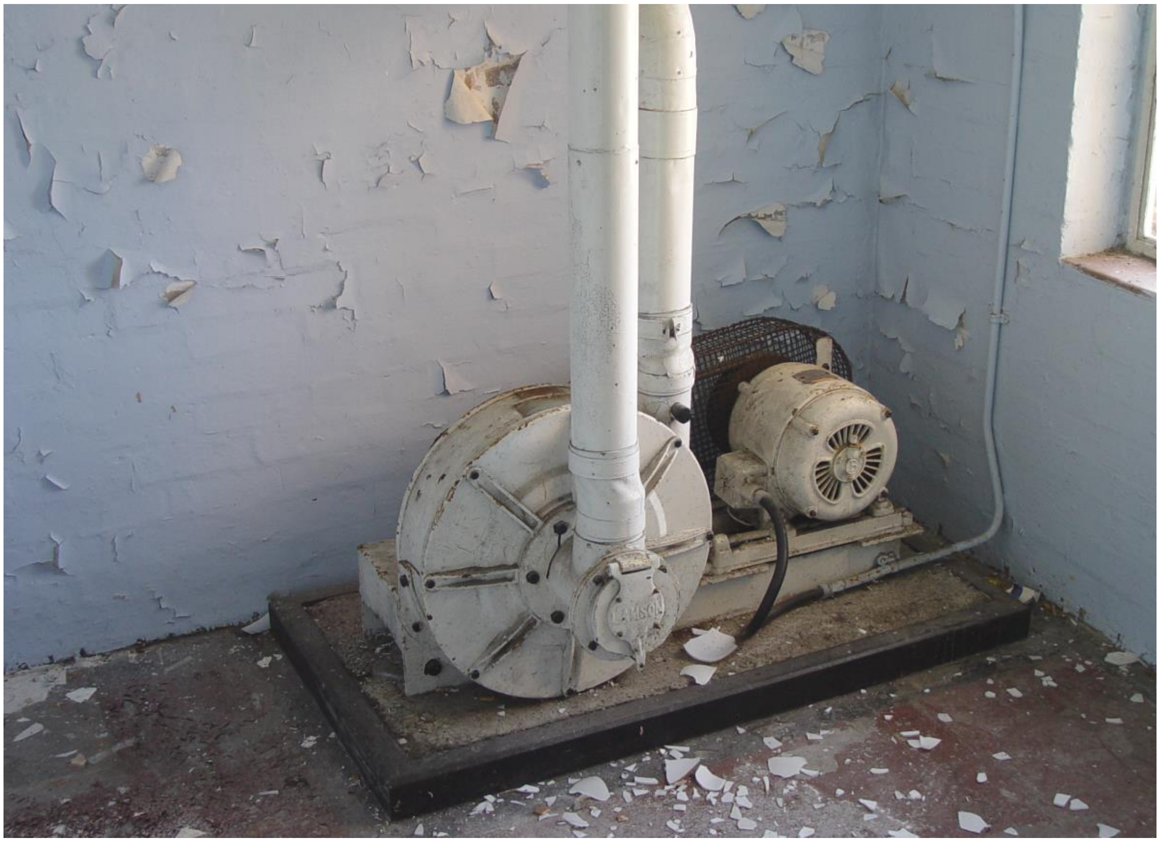

Plate 15: The Lamson Plant

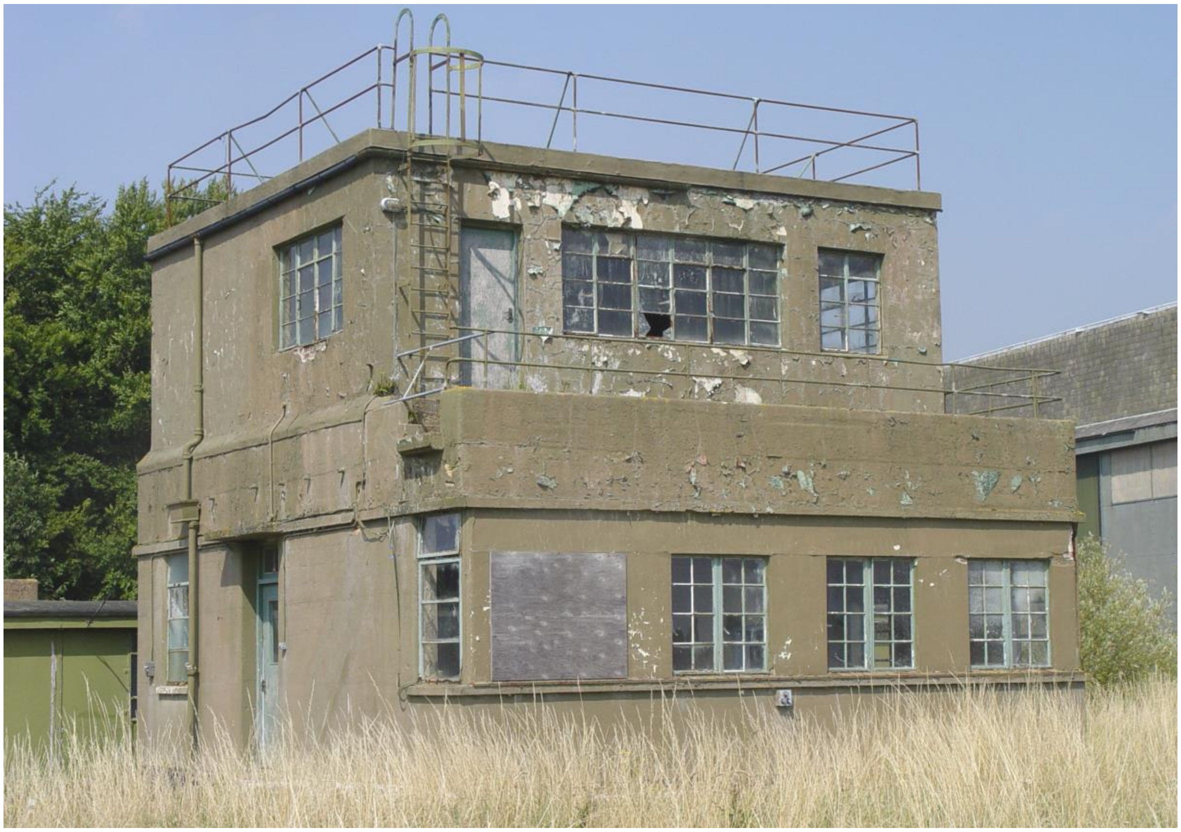

Plate 16: The Watch Office with Tower (Tower Removed). This building is the central point between symmetrical line of the hangars

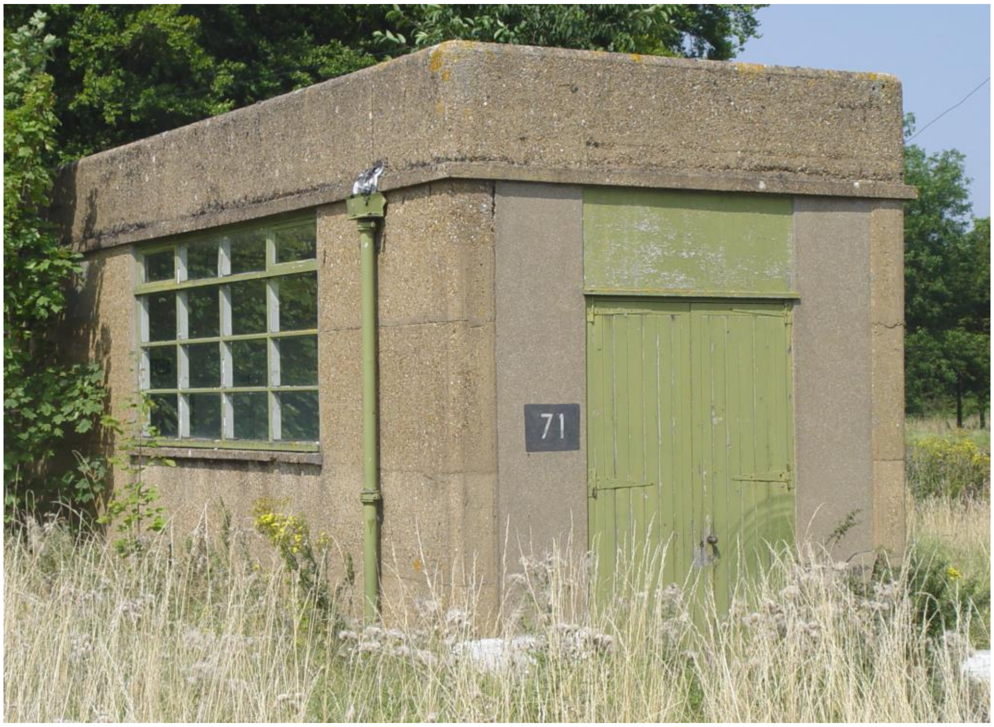

Plate 17: The Ambulance Shelter, one of several buildings that were once part of the WWII air traffic control group of structures

2.7 RAF Sculthorpe

RAF Sculthorpe as it stands today is an excellent example of an early Cold War RAF Station; it retains buildings dating from WWII and the mid-1950s but was never developed beyond this period. It is therefore a 'snapshot in time', containing many American-designed and built Butler Sheds which make up the majority of the technical and domestic infrastructure. Some of these buildings contain USAF artwork.

The domestic area has now been sold and is separated from the airfield by fencing. The airfield itself is as-built with original length runways (with airfield lighting), American style warm-up aprons, a mixture of medium bomber and heavy bomber hardstandings and at least four POL stations (each storing 200,000 US gallons of aviation fuel). There is also a typical American mid-1950s technical area with two wartime T2 hangars plus various Nissen and Romney sheds. Dispersed around the perimeter track are another two T2 hangars, a Nose Docking Shed as well as a Bomb Stores to the NE.

The VHB Control Tower faces east; it is positioned close to a length of original perimeter track and is built on the site of the WWII Watch Office[7]. The technical site is immediately to the west and beyond this is the domestic area.

The Sculthorpe building is a right-hand version (similar to West Raynham) and is now part of a complex of structures that includes a mid-1950s American-built Flightline Fire Station and associated offices. This is based around a Butler Shed and a coupled Butler Shed arranged at right-angles to each other. There are also three surviving WWII vintage 16ft span Nissen huts remaining on this site (the Crash Hut and two general purpose huts). To the north is an Aircraft Servicing Apron constructed on the site of a WWII hardstanding and to the south is a medium bomber hardstanding.

The Signals Square and Airfield Code Letters are also extant. The original fire station and NFE store has had all main openings bricked up and windows inserted for conversion into a bar area and rest rooms.

The VHB tower survives in very good condition although it has a few problems; the brickwork of the main building is sound, all windows are present although some panes have been broken. The Studwall partitions on all floors are similar to West Raynham although there are some minor differences on the first and second floors but the interior brick walls are as drawing 294/45. There is no Lamson plant or associated pipework present but the VCR ladder is in situ.

The VCR is in fairly good condition and appears to be water-tight but some of the glazing panels have been smashed. The double-glazed window frames have been lined with hardwood which has helped with the preservation of the superstructure and mild-steel panels. The interior is furnished with a similar airfield lighting control panel to West Raynham and it also has the Controller's desk with other ATC electrical equipment present including a aircraft communication panel (see plate).

The main concern is the roof over the toilet annexe (used as a air conditioning plant room) which is leaking rain water onto the floor below. The NFE Store has also a structural problem below the lintol over the main door opening.

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[7] 13726/41 Watch Office for Bomber Satellite stations

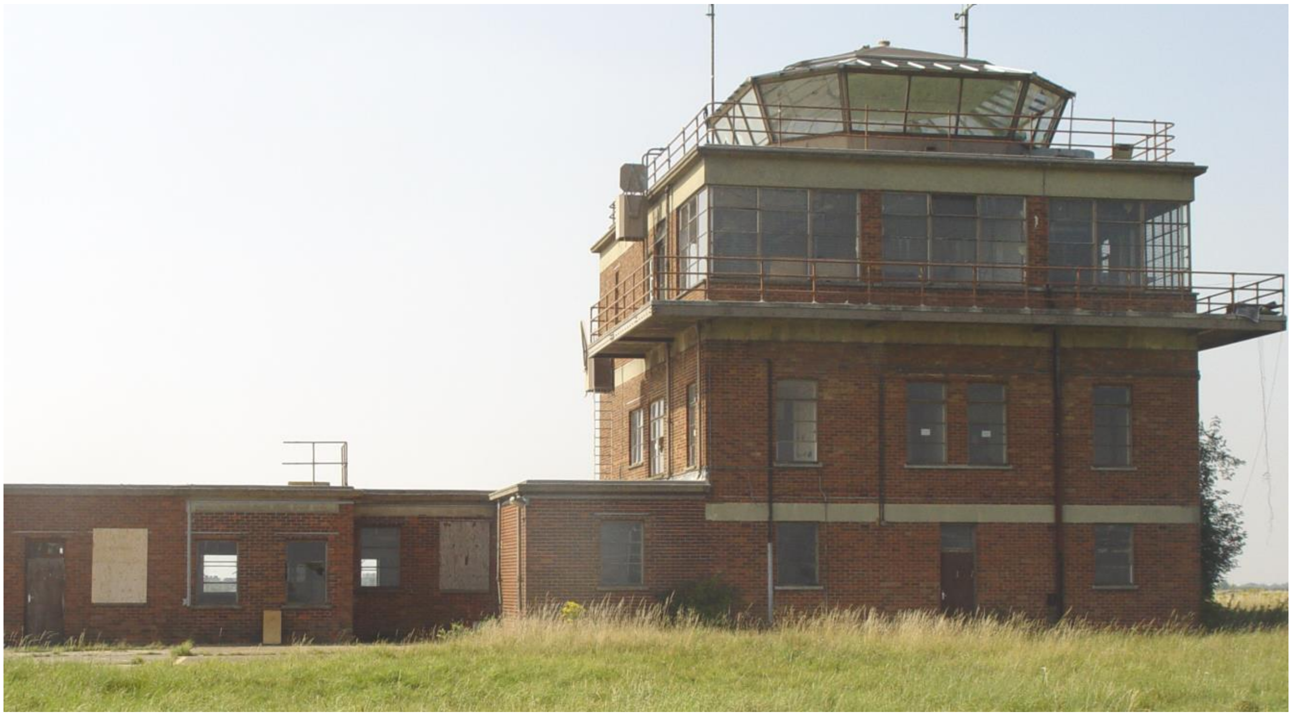

Plate 18: Front elevation of Sculthorpe's VHB CT

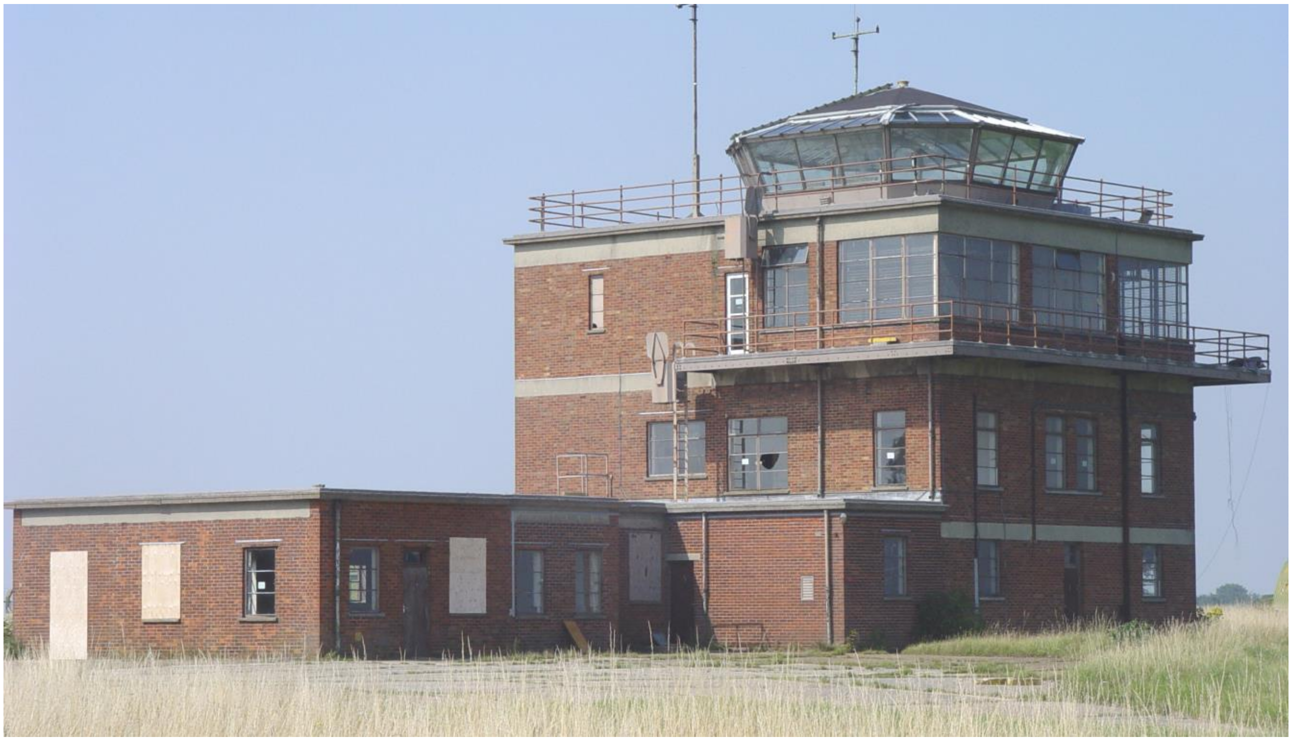

Plate 19: Sculthorpe - another view - showing the bricked-up NFE Store and Fire Station

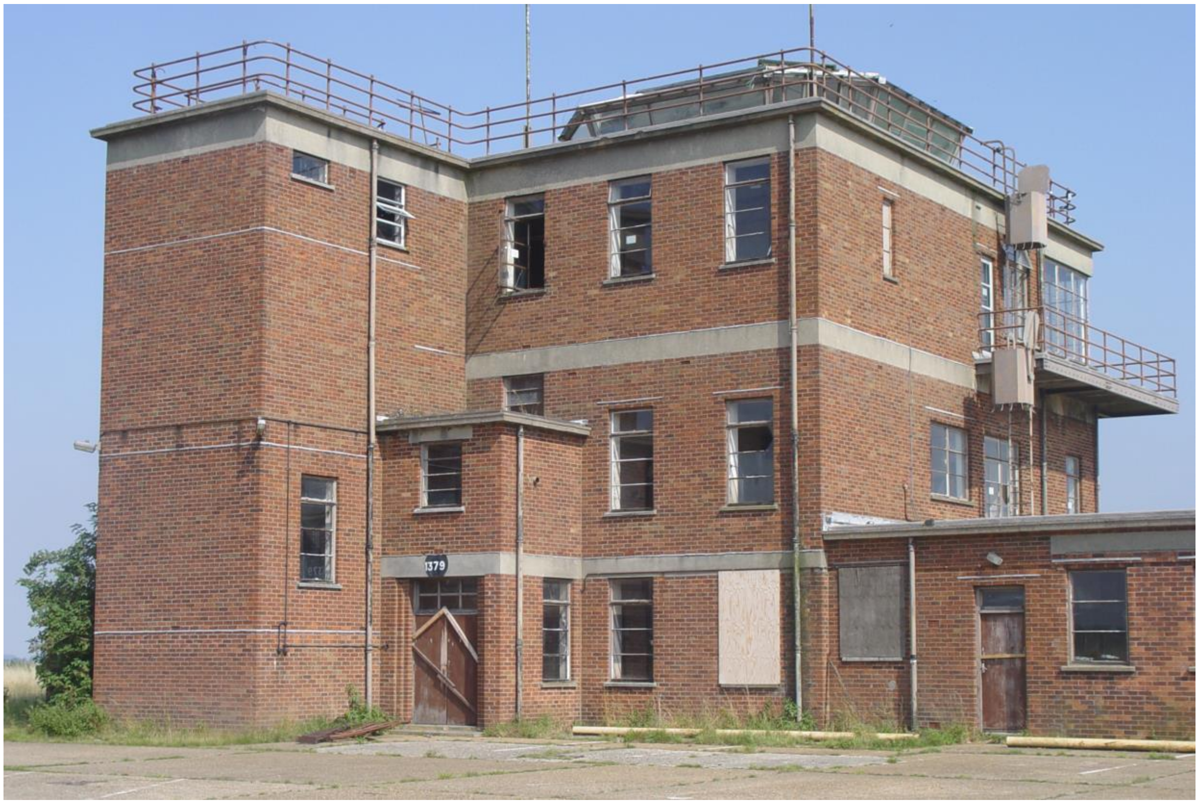

Plate 20: Rear view (west elevation) of Sculthorpe's VHB CT

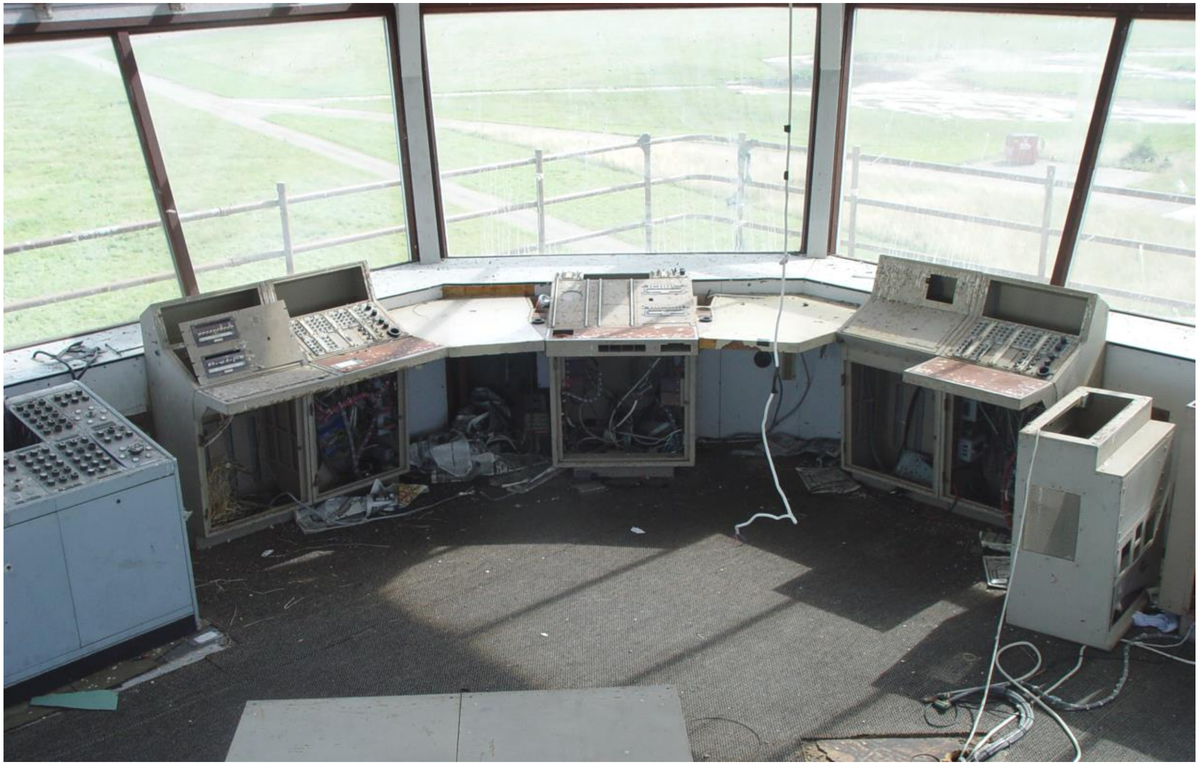

Plate 21: Interior of Sculthorpe's VCR - the Airfield lighting control panel is on the extreme left of the picture

Plate 22: Sculthorpe's Flightline Fire Section and another airfield vehicle shed - these are all Butler Sheds

Plate 23: A typical Technical building - a coupled Butler Shed at Sculthorpe

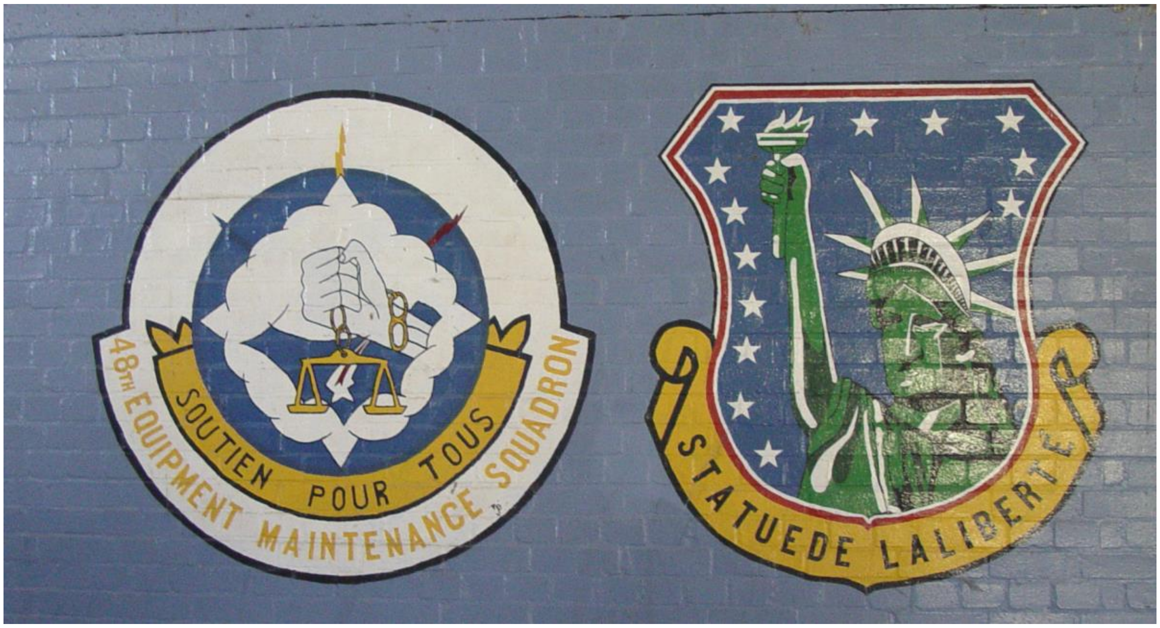

Plate 24: Sculthorpe - wall art inside the Butler Storage Shed shown in Plate 23

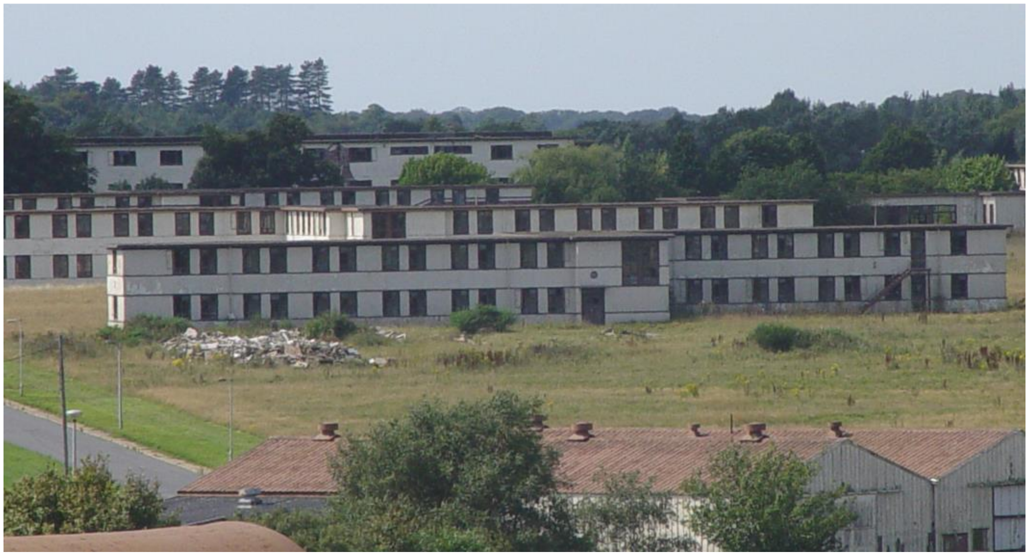

Plate 25: West view from the roof of Sculthorpe's VHB CT showing the huge Other Ranks Z-form Accommodation Blocks

Plate 26: View from Sculthorpe's VHB CT showing the airfield code letters 'SP'

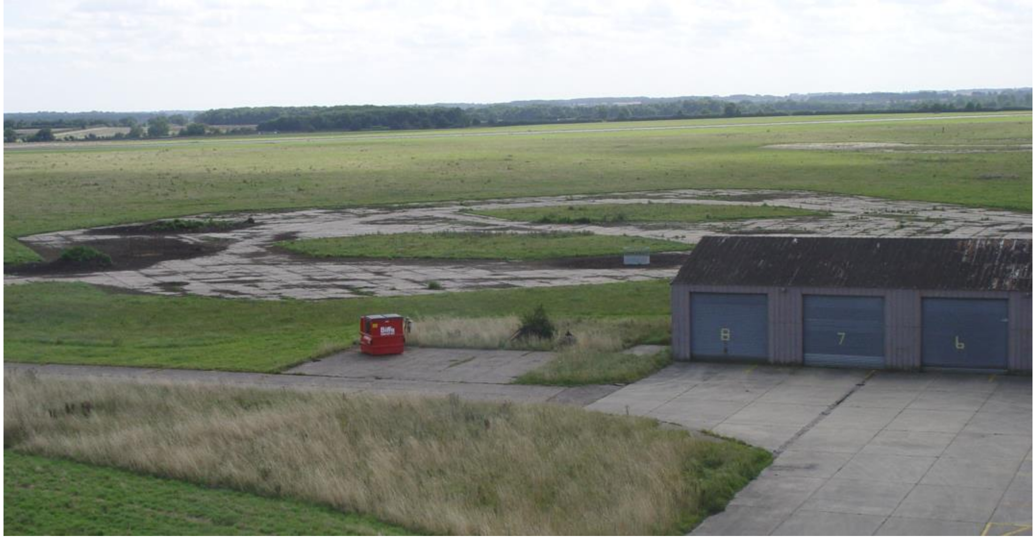

Plate 27: Sculthorpe - southern view from the VHB Control tower showing the fire station and medium bomber hardstanding

2.8 RAF Marham

2.8.1 Introduction

RAF Marham was the first station designed and built within the RAF Expansion Scheme (Scheme 'A') at a cost of £453,500. The first stations designed under Scheme 'A' were planned by the architect A Bulloch, ARIBA and altogether 13 new airfields were built under this scheme. In February 1935 the Air Ministry approved initial funds for ground preparation work at Marham and the heavy bomber station opened on 1 April 1937. The airfield then closed at the end of March 1944 and after reconstruction as a VHB station, it re-opened during January 1946 (the first VHB station to open) as the Central Bomber Establishment.

Prior to the introduction of the new V-class medium-bombers during 1955, the station underwent a major reconstruction programme to bring it up to a Class I Station. This expenditure (approved by the Treasury in April 1954) included, hardstandings, domestic and technical facilities, a bomb stores, approach lighting and additional fuel installations.

2.8.2 VHB Control Tower

During the WWII planning phase, it was decided to build the control tower on the southern side of the airfield with the runways to the north and beyond these is the hangar crescent consisting of five Type 'C' Aircraft Sheds. The building is therefore a mirror image of the drawing 294/45 and its arrangement is similar to that at Lakenheath.

The building is the current ATC centre of operations and therefore has been modified to suite modern ATC requirements. The structure survives in excellent condition with original room partitioning and internal planning but the Lamson plant and its associated pipework are missing. The main difference between it and the other buildings, is its fenistration. Original windows have been replaced with aluminum casements and additional glazing units have been fitted internally. The second floor approach control room still functions in this way and as a result the windows along the front elevation have been removed and the openings bricked up with 11in cavity brick. This has been carried out sympathetically using wire-cut rough-faced facing bricks of a modern type similar to the original. There are high-level narrow-framed windows along this elevation that are above the approach control PPI screens.

The VCR survives in good condition although the original glass panels have been replaced with new units. There is also a new porch added to the exit to get access to the roof of the building but the original sliding door is extant. The balcony and original handrails are all present.

The Fire Station and NFE Store annexe is extant but the openings have largely been bricked up for conversion into offices, a radio workshop and rest rooms.

Outside at the front of the tower are the airfield code letters and signals square which are all in excellent condition but disused. Close by there is also a weather station and concrete foundation blocks of a communication's lattice tower.

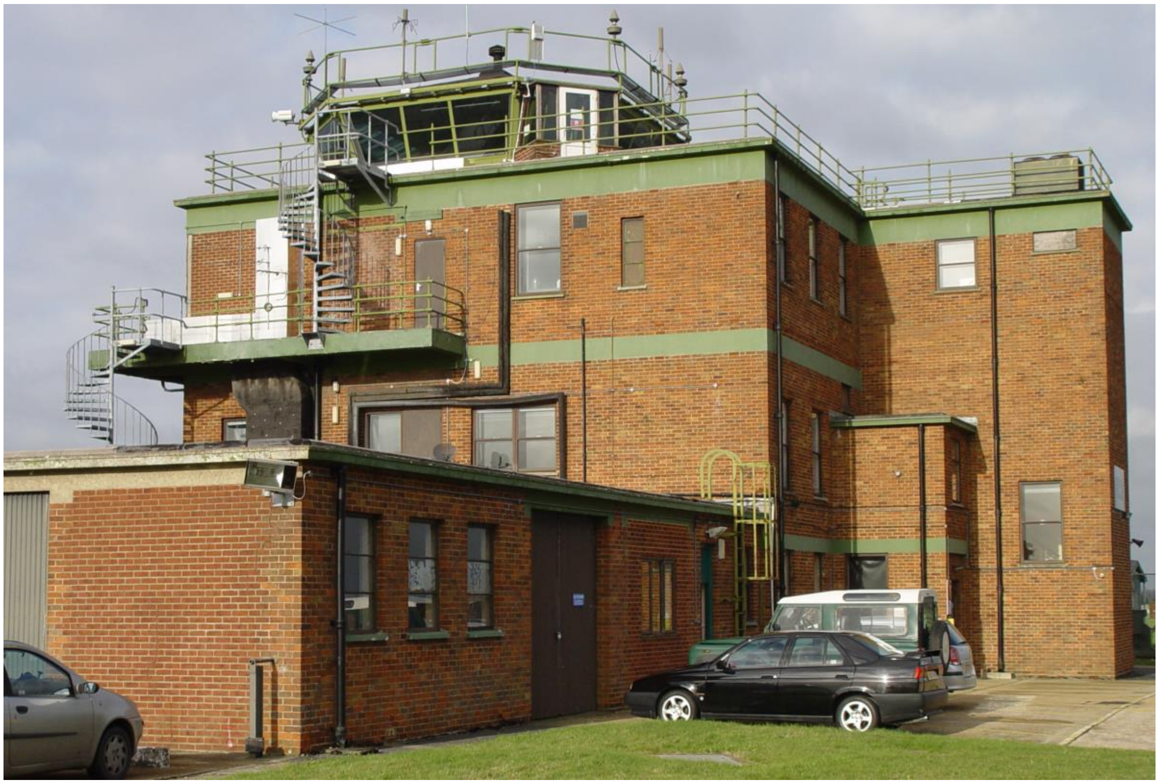

Plate 28: Side view of VHB CT at Marham

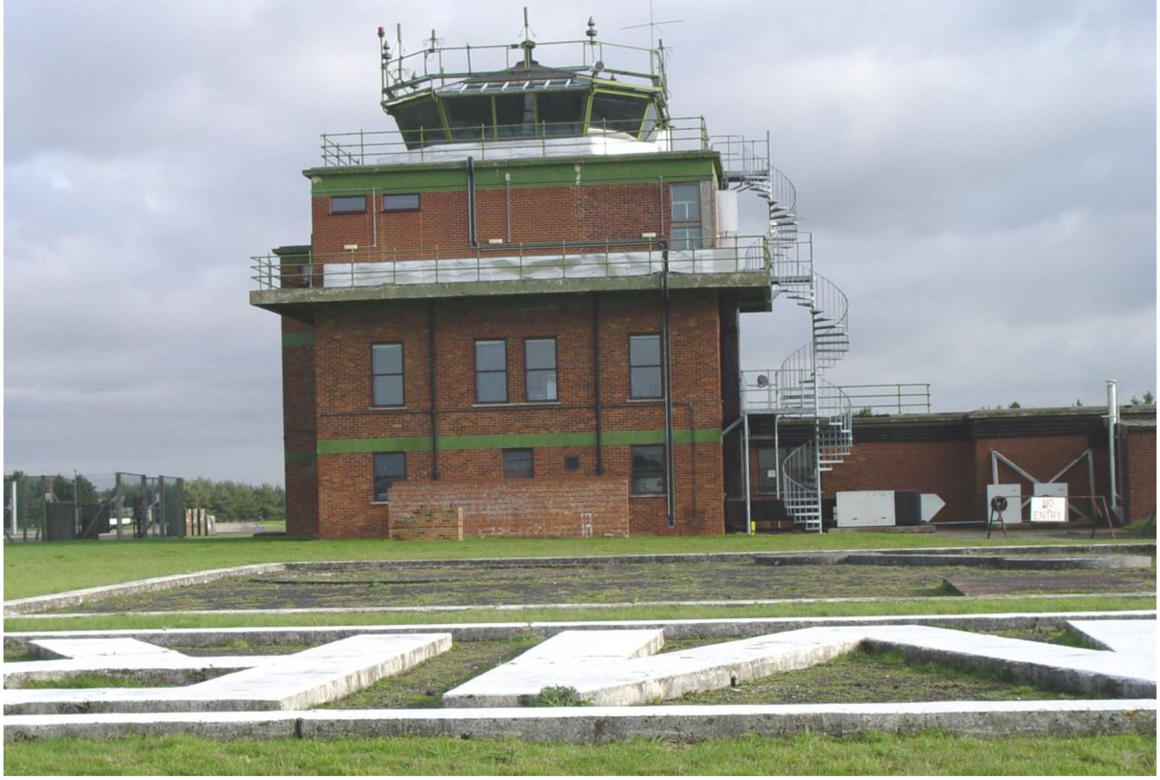

Plate 29: Front view of VHB CT, Marham with Airfield Code Letters & Signals Square. Note the brick in-fill of the windows at second floor level

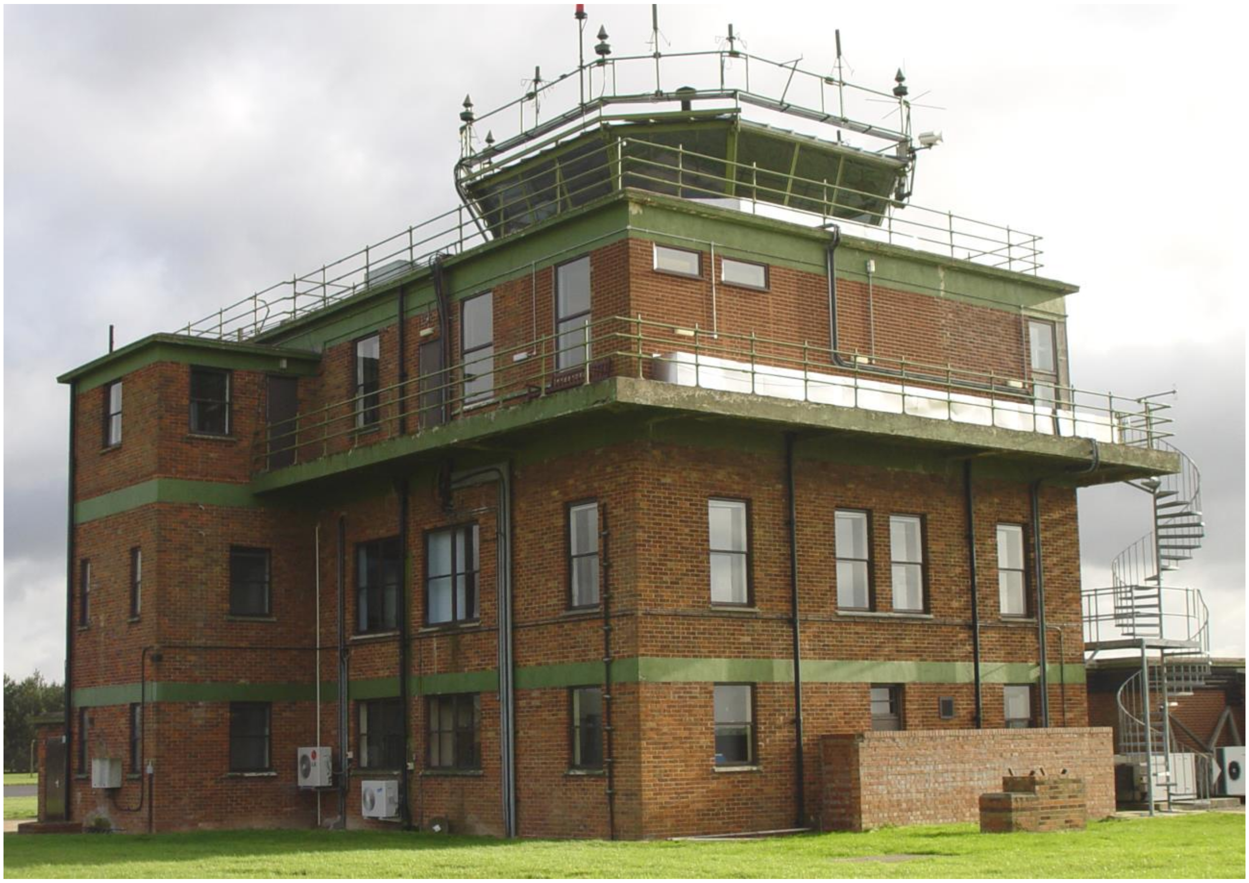

Plate 30: South and west elevation of VHB CT at Marham

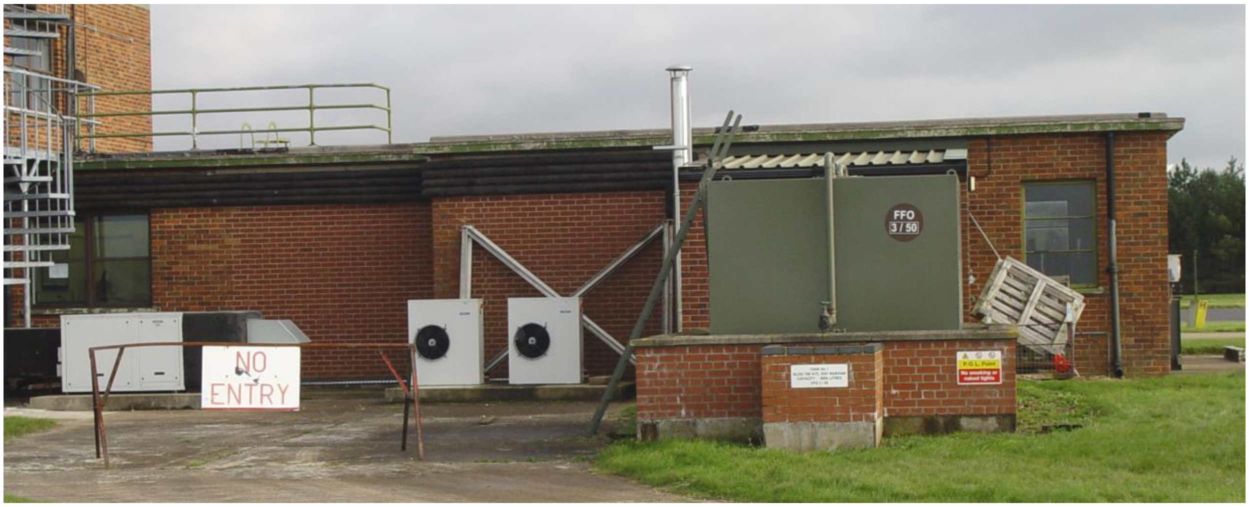

Plate 31: Marham's Fire Station front elevation showing bricked-up garage openings with more modern structures

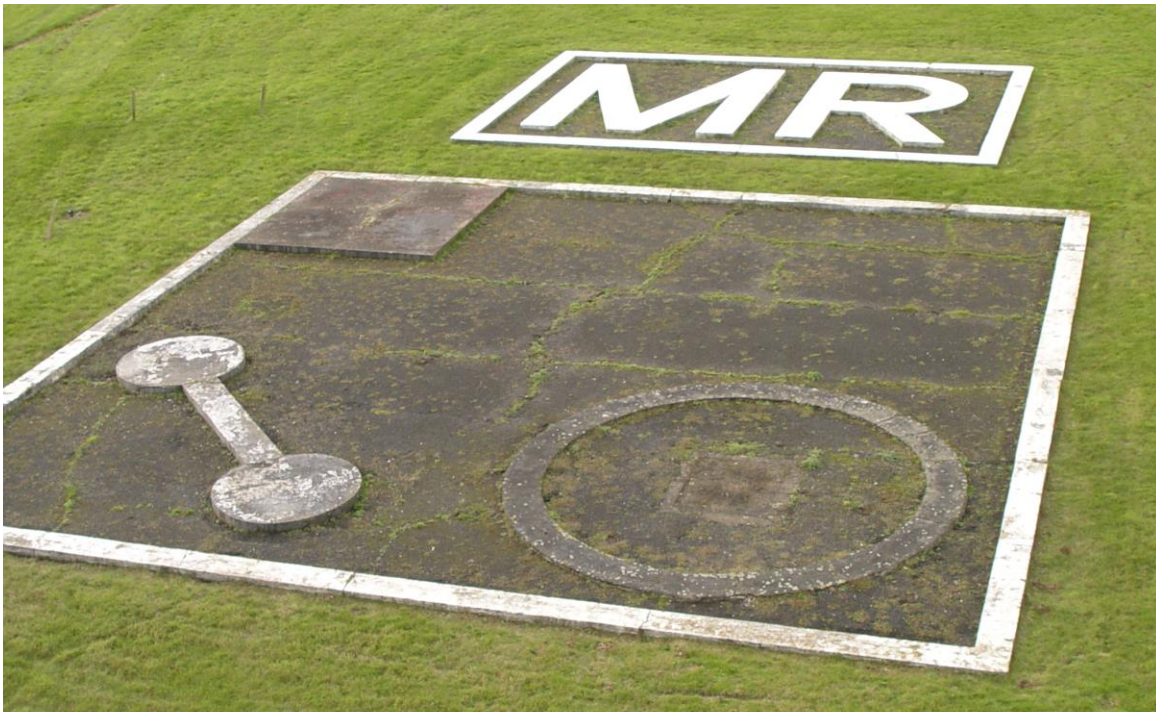

Plate 32: Signals Square

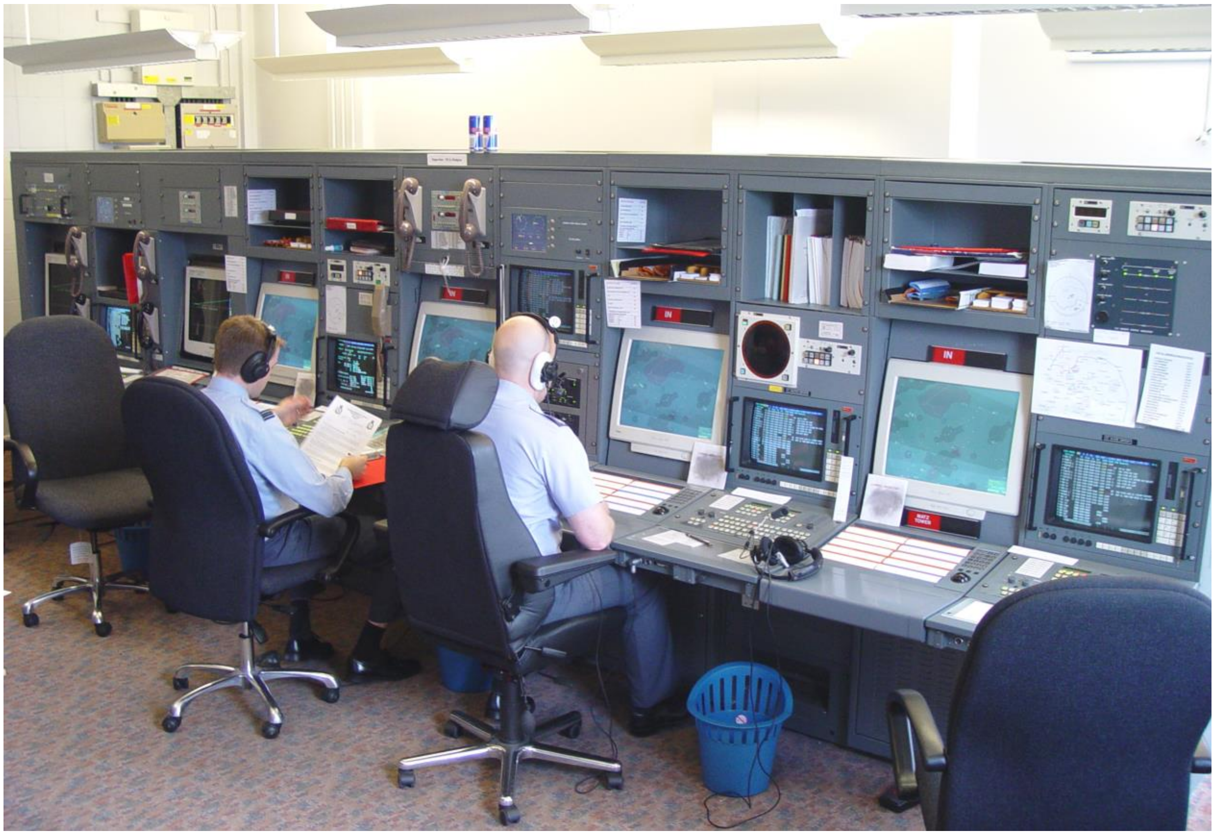

Plate 33: Marham - interior view of Approach Control Room.

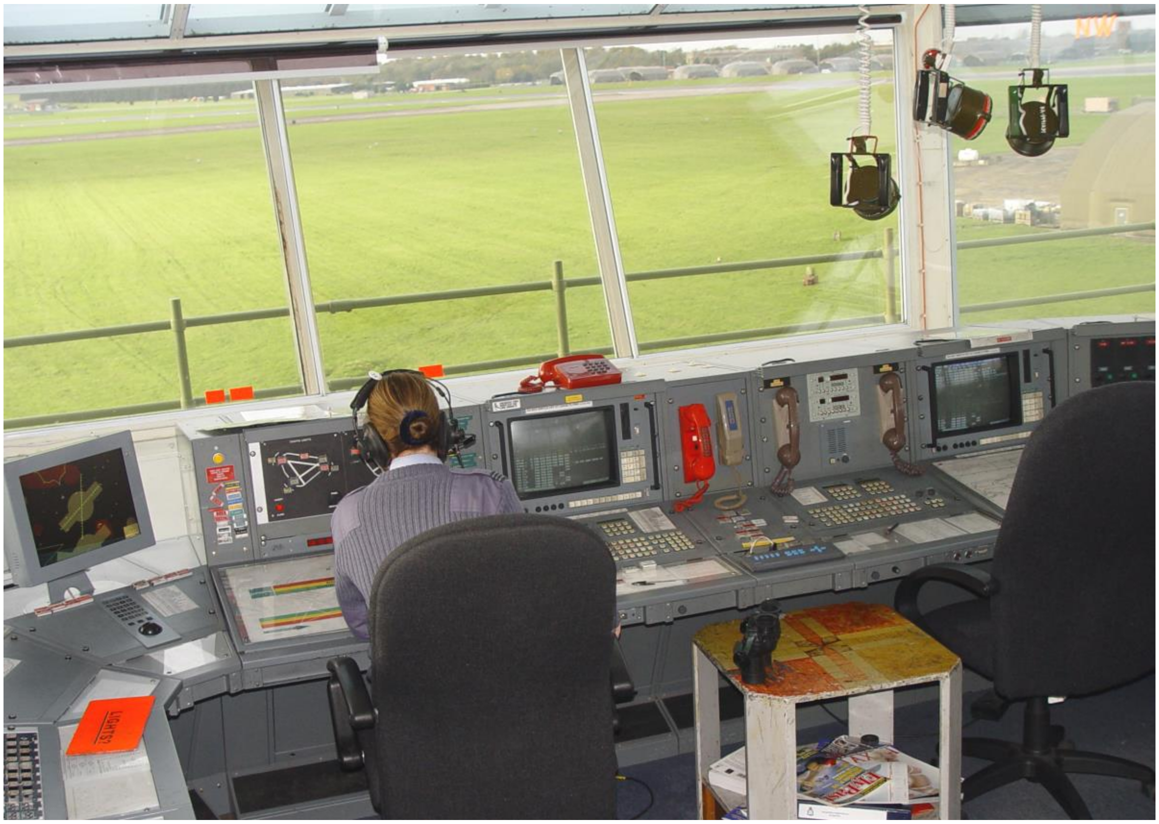

Plate 34: Marham - interior of VCR

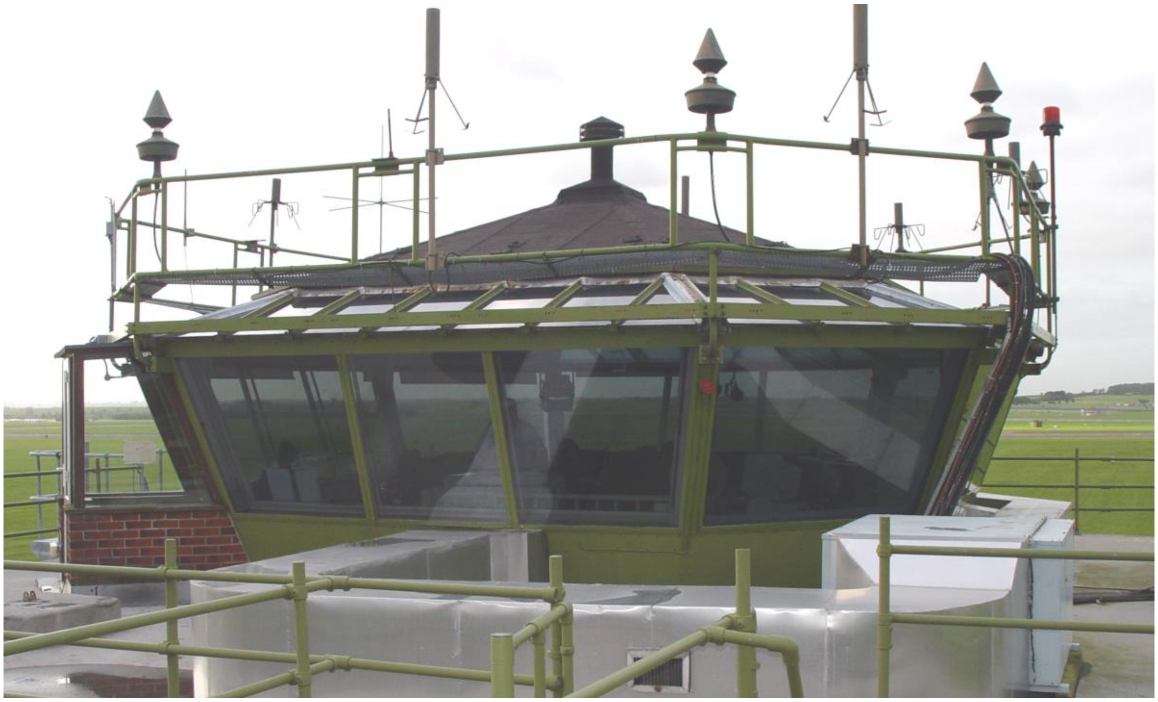

Plate 35: Exterior view of Marham's VCR

Part 3 Conclusion

3.1 General

There is very little to choose between the three derelict VHB Control Towers, they are all of a similar condition, standard and quality. Fenestration is an important issue and all of these buildings score highly here - no single building stands out as being superior. Being four-storey height (including the VCR) all examples are dominant structures within the airfield landscape and technical area. The Marham example has been modernised and continues to function as the station's ATC building, consequently it has lost its original windows which rather upsets the well-balanced original architectural treatment, especially to the front elevation. The Marham building can therefore be discounted.

3.2 RAF Lakenheath, RAF West Raynham and RAF Sculthorpe

3.2.1 Observations

They each have merits and disadvantages and all score highly with regards to context - they are still associated with other structures and contemporary pavement features. All would satisfy the Listing criteria as published in PPG15; it would therefore be very difficult to choose just one building for Listing.

The following bullet points are important:

3.2.2 Lakenheath

- The RAF station is active and has been in almost continuous operation by the USAF since it re-opened after reconstruction. It has been extended beyond the VHB runway standard and over the course of the last fifty years the station has been continuously developed with new infrastructure.

- The VHB CT has been built on an elevated position that overlooks the active runway with the technical site beyond. There are excellent views of this from the roof of the building while in the opposite direction the vistas go beyond the station boundary out into the open countryside. The building can be seen from vistas viewed from many areas along the A1065, particularly at Wangford where its elevation position can clearly be seen.

- It is the only example where the NFE Store retains its roller shutters.

- The Signals Square and Airfield Code Letters survive in excellent condition

- Within the immediate area are the WWII Battle Headquarters, an LAA position and a Cold War pillbox. The concrete floors of other WWII structures are also present within the immediate area.

3.2.3 West Raynham

- The aerodrome survives as a complete RAF Expansion Scheme 'F' station with elements from later schemes as well as those belonging to WWII. The station was never developed to the VHB standard. There are excellent surviving airfield defence, technical, domestic and married quarter elements plus two runways, a WWII Bomb Site and a large Cold War Bloodhound Missile area. The site is surplus to

MoD requirements and is up for sale. The completeness of the infrastructure at RAF West Raynham is an important aspect of the site that deserves further investigation and consideration. West Raynham is the only one of this group that retains a Watch Office that was in use during WWII.

- The VHB CT is located beyond the pre-WWII buildings (hangar crescent) and is separated from these by large Cold War Aircraft Servicing Aprons. In contrast to the original Watch Office, the VHB CT is out of alignment with the camp to bring it closer to the two runways. There are extremely good views from the roof of the building with vistas towards the station infrastructure including the original Watch Office. The view towards the runways also includes the Bloodhound site. The airfield landscape is smaller - perhaps 50% of that of a typical VHB station such as Sculthorpe.

- Built adjacent to it is a link-detached Fire Station.

- The Lamson plant is extant.

- The Signals Square is extant (Airfield Code Letters could not be found but there is a Meteorological Enclosure).

- The Airfield Lighting Control Panel and Controller's desk are extant in the VCR

3.2.4 Sculthorpe

- RAF Sculthorpe survives as an unaltered VHB Station complete with its three runways, a Technical Site and a domestic area (private). The station's infrastructure is largely of American origin belonging to the period 1954 to 1956.

- The VHB CT is positioned off of the main perimeter track, between the N-S runway and the technical site. Beyond the Technical Site to the NW is the domestic area which enjoys a slightly elevated position overlooking the aerodrome. From the roof of the building there are excellent views of both of these areas; while within the immediate locality is a servicing apron and a medium bomber hardstanding. The eastern vista is of the huge airfield landscape (the scale of the airfield compared with West Raynham is quite striking). In the distance are dispersed hangars including a Nose Docking Shed and beyond this is the Cold War Bomb Stores.

- The building is part of a complex of WWII and American-built buildings that appears to be complete as a group from the 1950s VHB active period.

- The Signals Square and Airfield Code Letters are extant

- The VCR retains most of its electrical equipment and furniture including the Airfield Lighting Control Panel

Appendix 1: RAF Control Tower Development

In terms of control tower development and how the VHB building fits into the sequence of development from 1926 to 1965, there have been nine stages for operational RAF bomber stations (excluding satellite stations) and two for transport stations:

RAF Operational Bomber Watch Office and Control Tower Development Sequence				
Type	*Drawing Number*	*Period of Construction*	*Details*	*Numbers Built*
Accommodation for Officer of Watch at Bomber Stations	10726/26	1926-1933	Single-storey brick bungalow with pitched roof	15 approx
Watch Office with Tower	1959/34 &	1934-1938	2-storey brick or concrete with concrete floors	41
Watch Office with Meteorological Section		1939-1941	2-storey brick or concrete with concrete floors	29
Watch Office with Meteorological Section - austerity version	518/40	1940-1941	2-storey brick with timber floors	37
Watch Office/Control Tower	12779/41 & 343/43	1941-1944	2-storey brick with concrete floors	162
VHB Control Tower		1945	3-storey steel frame and brick, concrete floors. Steel 1st generation VCR	4
Control Tower (Revised Type)	5223a/51	1951-1954	Two-storey brick with 2nd generation VCR	7
Control Tower - 'V'-Bomber Stations	unknown	1953	2-storey brick and concrete floors with 3rd generation VCR	2
Control Tower - Vertical Split Control type Master Diversion Airfield	unknown	1955?	2-storey brick and concrete floors with 3rd generation VCR	1 possibly 2
Control Tower - Vertical Split Control type	2548c/55	1955-1960	2-storey brick and concrete floors with 3rd generation VCR	18
RAF Operational Transport & Coastal Watch Office and Control Tower Development Sequence				
Watch Office without Meteorological Section	unknown	1940/1941	2-storey brick with concrete floors	3
VHT Control Tower	unknown	1944	3-storey brick with concrete floors with signalling pent house	2

Appendix 2: Sources

Raynham Reflections - A Short History of RAF West Raynham by Wing Commander W.J Taylor, RAF - Services Publishing Services (SPS), 1989

Air Ministry Drawing 294/45

RAF Lakenheath Site Plan

RAF West Raynham Site Plan 1619/45

RAF Sculthorpe Airfield Site Plan 2683/44

OS May XX14.4, 1906 Dunton